

Living with Crypto

Learn more about this common parasite.

by Brooke Byrd

Cryptosporidium (crypto) is a common intestinal parasite that often rears its ugly head, but its actions are often mild compared to other calffood diseases. “If you look for cryptosporidia, chances are very good you’re going to find it, but finding it doesn’t necessarily mean the disease is present,” says Bill Shulaw, Ohio State University Extension veterinarian. “Not every animal that gets infected is going to get sick.”

A 1992-1993 National Animal Health Monitoring System (NAHMS) study found crypto was widespread and very common in U.S. beef herds. Approximately 40% of the herds surveyed — including herds that had diarrheic animals and those without — had at least one animal test positive for crypto.

The crypto organism is in the same phylum of the animal kingdom as coccidia, Shulaw says. In particular, the species that affects young calves is *Cryptosporidium parvum*. This parasite of the small intestine attaches to the cells lining the intestinal walls and destroys them. The cell loss “opens the surface of the intestine to invasion by bacteria and irritation by gastrointestinal fluids,” he explains. “Depending on how much lining cell loss actually occurs, you may see anything from practically nothing to severe diarrhea.”

When the cells are lost, they must be replaced. Until they are, Shulaw says, “There’s a loss of fluid across the cells and potential for bacterial invasion of the deeper tissues of the intestinal tract.”

Contamination

Calves are exposed to crypto through the fecal-oral route, Shulaw notes. An infected calf sheds huge numbers of the parasite in its oocyst (infectious) form in manure. “They’re pretty resistant to destruction, and they contaminate the environment in quite large numbers,” he says. During peak shedding, “It isn’t too unusual to see a million or two or more oocysts in a gram of stool material.” A gram is about ¼ teaspoon (tsp.). Calves become infected through contamination of feed and water, licking themselves, or exploring the environment.

“If the parasite gets in the mouth and is swallowed, the life cycle begins again with attachment and replication on the intestinal tract,” Shulaw says, “and the process is repeated.”

Once the cycle starts again, the peak oocyst shedding is in the first three to four weeks. “After the parasite has generated

several times in the intestinal tract, the host develops an immune response, and shedding tends to shut down,” he notes. “There may be some very low shedding later in life, but most shedding is pretty well over in two weeks to a month.”

Cattle consequences

“The cost to individual farms is in terms of days of diarrhea and potential losses due to treatment and lost weight gain on those calves,” Shulaw notes. “Depending on how sick they get, it could result in death.”

However, he says, if a calf isn’t stressed by weather or other causes, not infected by other bacterial or viral pathogens, and receives adequate nutrition, severe illness and death are not common. Shulaw has found this in some of his own research.

“One herd we studied was a 400-cow dairy herd, and in one year they lost two calves — yet we found cryptosporidia in well over 90% of the calves,” he says.

“But, if the calf’s pretty stressed by cold, poor nutrition or mismothering,” he says, severe diarrhea and death may result. “And, the possibility exists that there will be severe enough damage in some calves’ intestinal tracts that they never really fully regain their

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PHOTO BY MIKE BOYATT

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potential for growth.” The trauma follows those calves to the feedlot, where they become chronic poor-doers — and a loss of money for everyone involved.

Human consequences

C. parvum is also a zoonotic species —

one that can spread from animals to humans. The cattle genotype can infect people and cause diarrhea, Shulaw says. In most people, it may cause mild or severe diarrhea, but death or severe illness is rare. However, in people with suppressed immune systems, such as those infected with

the AIDS virus or those undergoing chemotherapy, crypto can be much worse.

“Because of the defect in their immune system, they’re not able to fight it off like a normal person does,” he explains. “It’s a severe, life-threatening disease.”

Animal-to-human transmission can also occur through the water supply. “All segments of the cattle industry must pay attention to manure management and avoid allowing fecal material to get into surface water or groundwater supplies,” Shulaw emphasizes. “It’s commonsense manure management.”

Shulaw emphasizes the importance of protecting riparian areas to avoid defecation directly into the water. In addition, if applying possibly infected manure as fertilizer, he warns, “Be careful not to apply it when the ground’s frozen, or there’s a high potential for rain and wash-off into the ground or surface water, or when the soil is cracked, like in a drought.”

Detection

Since crypto is very common, it is often found when testing diarrheic calves. “If nothing else is found, it’s very tempting to hang our hat on cryptosporidia as the diagnosis for the disease, because it’s easy to see,” Shulaw says. “Nailing down cryptosporidia as the primary cause of your calf scours outbreak is going to require a little more work than that.”

To make a definite diagnosis, other organisms must be excluded from the diagnosis list — but they can be hard to find. “Rotavirus and coronavirus are at the root of many calf scours problems, but they’re harder to find,” Shulaw explains. “They’re only detectable in the manure for a day or two; whereas with cryptosporidia, you can probably detect it every day for several days in a calf’s stool.”

Some detection can be made by understanding the time frame of infection. Coccidia infection isn’t seen in the first two weeks of life, because its life cycle takes longer. “Typically, in the first week of life, diarrhea is caused by rotavirus, coronavirus and *E. coli*,” Shulaw says. “Crypto might be involved in the first week, but usually it’s just a little later — at least after the fourth day.”

A veterinarian is usually needed to make the definitive diagnosis. “They put the picture together — the history, the clinical signs, the age groups, along with some diagnostic testing,” Shulaw notes.

Studying crypto

In the May 2005 issue of *Agricultural Research* magazine, cryptosporidia (crypto) and its effects on humans and animals alike were spotlighted. Agricultural Research Service (ARS) Research Associate Monica Santin, who worked on the crypto study (Santin et al. 2004), explains the importance of the research.

“The main impact of the study is that the zoonotic (transmissible from animals to humans) species appears only in animals that are less than 8 weeks old,” she says. “We need to get focused in that age range.”

The study was based on dairy cattle during a period of four years, says ARS Research Biologist Jim Trout. Each year, samples were taken from a different age group.

“*Cryptosporidium parvum* is the zoonotic species — that’s the one that infects humans,” he says. “Almost exclusively, *cryptosporidium parvum* was found in calves younger than 8 weeks of age.”

The other species/genotypes found during the study — *C. bovis*, *C. andersoni* and *Cryptosporidium* deer-like genotype — “are species that appear to only infect bovines,” Trout notes.

In calves with crypto that were less than 8 weeks of age, 85% of the crypto found was *C. parvum*. In older calves, between 1% and 6% had *C. parvum*. “A few of them still do have parvum, but far and away most of what they have appear to be something that only infects cattle,” he says.

“The research opens the door to a reevaluation of what animals really present a risk,” Trout notes. “If you’re interested in looking at the animals that present the greatest risk of contributing a zoonotic type of crypto, which is *C. parvum*, to the land or to the water, our research shows there’s a much greater risk of getting that from the younger animals than from the older animals.”

While the study in question was done with dairy cattle, Trout says he expects a study of crypto in beef cattle within the next four years. The results, he cautions, could very well be different.

“There’s no guarantee that you’ll see the same pattern in beef that you see in dairy, because there’s quite different management practices in raising dairy versus raising beef,” he states. “It’s possible those different practices might result in a change in species of cryptosporidium we see.”



► Postdoctoral scientist Monica Santin (left foreground) and technicians Kristin Cameron and Robert Palmer prepare PCR samples to detect cryptosporidium as zoologist Ron Fayer (right) examines banding patterns in agarose gels for positive specimens.

PHOTO COURTESY OF ARS

Prevention

Crypto is a problem best handled by prevention. “Prevention in terms of overall sanitation, good nutrition and low stress for the calves is desirable for lots of reasons besides just the cryptosporidia bug,” Shulaw notes. Those prevention practices all reduce the risk of severe disease in infected animals.

Since there are no disinfectants approved for killing crypto, Shulaw says good sanitation is crucial. “That’s always a good recommendation to prevent calfhood disease.” Sanitation is especially important because of the contamination method — shedding through diarrhea.

“Once a calf gets sick and has scours, the numbers being shed are very high, so the potential to contaminate even more animals in the herd becomes higher,” he says. “So anything you do to reduce that potential will help not just with crypto, but protection for other agents as well.”

Shulaw recommends methods like the Sandhills system in which calves are isolated in separate pastures by age group after calving (see “The Sandhills Shuffle” in the March 2004 *Angus Beef Bulletin*). “It reduces

the potential for a calf to get exposure in an area where there are a lot of young calves and the potential for a scours outbreak is higher,” he explains.

There has also been some work done with a vaccine to be given to the cow. “There’s some potential for vaccines to be helpful, but as of today, there aren’t any licensed for use,” Shulaw says. “If such a vaccine becomes available, it will be necessary to do a cost-benefit analysis to see if it is worth it.”

Crypto is present in most herds, but only some have serious problems as a result, he says. “You have to identify what the factors are at the farm that seem to cause that farm to have more problems, and then if the vaccine would reduce the numbers of infection or severity of infection.”

Another problem with a vaccine results from the time frame of infection, Shulaw warns. “You have an organism that’s capable of infecting a calf for two to three weeks after the calf is born, but the highest amount of protection we typically get from vaccines given to the cow occurs in the colostrum, and after the first couple of days, most of the colostrum is gone.

“It’s always been a difficult challenge in

cattle to get antibodies into the milk as opposed to the colostrum,” he continues.

Treatment

“There’s no specific treatment for cryptosporidia,” Shulaw says. Antibiotics don’t work — although they may help stave off secondary bacterial infections caused by cell loss. If calves are affected by diarrhea enough to become dehydrated, he says fluids are always indicated (see “Fight Back with Fluids” on page 64).

He emphasizes that cryptosporidia infections in cattle are common and rarely cause for concern. “They don’t always cause severe diarrhea, but can, especially in animals that are either immunosuppressed as a result of another virus infection; lacking in nutrition; or, worst of all, immunosuppressed, lacking in nutrition and affected by something like cold weather,” Shulaw says. “If you pile all of that on a calf, cryptosporidia may cause severe disease.

“It’s a fascinating bug, but it’s one that can be managed. Eradicating it will be very difficult; living with it is possible.”

