

Giardia

(*Giardia duodenalis*)

Giardia is one of several protozoan parasites that affect dairy cattle. Of the traditionally accepted six species of Giardia, only one, *duodenalis*, is common in calves. Of the seven genotypes of this species, only one (Assemblage A) uses both livestock and humans as hosts. Of interest to us are two forms the parasite takes on as it goes through its life cycle. One form is a cyst. This egg-like structure is shed in an infected animal's dung. The other form is a soft body with a tail (called a trophozoite). This particular Giardia genotype may cause infections in humans as well as livestock.

This resource paper contains:

- Transmission
- Cyst Shedding
- Cyst Survival in the Environment
- Diarrhea
- Recovery and Treatment

Transmission

Transmission from one calf to another is achieved by swallowing a cyst. The cysts most often come from the dung of infected heifers and cows. However, almost any source of muck or slurry can serve as a means of infection. Contaminated water is the most common source and is usually found to contain cysts.

Because these cysts are resistant to chlorine bleach, chlorinating systems for water do not destroy them. Because the cysts are tiny, 6-10 microns, most water filters do not remove them from the water supply. Standing surface water can also be the source of cysts.

In addition, calf rearers can carry the parasite from one calf to another on their feet, clothing and hands. An especially high-risk activity is handling water-feeding equipment. If a person's hands are contaminated with cysts from calf manure, they can pass them on from water bucket to water bucket.

Also, it is possible for feed to be contaminated. With calves, fecal contamination of concentrate pails and feed troughs by muck is common. Also, it is possible for both birds and insects to carry mechanically the pathogen from contaminated muck to concentrates and forage.

Cyst Shedding

The age of shedding in calves is most commonly between two and ten weeks. Calves shed both cysts and trophozoites. We are not concerned with trophozoite shedding because they die soon after leaving the body. Diarrhea usually occurs in the three to eight week age interval.

Shedding continues for at least one to two weeks in untreated animals and peaks most often in calves about five weeks of age. Unfortunately, while scouring may end after a couple of weeks, these animals can continue to shed cysts at a declining rate for a longer period. Olson estimated the shedding period may exceed 30 weeks.

Cyst Survival in the Environment

Before being passed out of the host's body, some of the soft trophozoites develop a hard shell. This results in a cyst that is very well protected. Cysts are not affected by common disinfectants such as chlorine bleach. The most favorable environment for survival is water. Cysts survive one to three months in water although longer times might occur. Moist soil will protect cysts for several months, as well. The key to survival is moisture. On a dry surface, nearly all cysts will be destroyed within one week.

Temperature is also an essential survival element, also. Cyst survival drops rapidly as the temperature approaches freezing. Evidence shows that freezing destroys cysts. Like cryptosporidia oocysts, Giardia cysts cannot maintain their shell integrity through freeze/thaw cycles. Very high temperatures also destroy cysts. Public health officials recommend boiling water for three minutes to destroy all cysts.

Diarrhea

While many factors are involved in determining an infective dose of any pathogen, it has been estimated that as few as ten cysts may cause a Giardia infection in a susceptible calf. Thus, the infective dose for most calves probably is quite low. This is especially true for calves that have a weak immune system. This might be due to failure of passive transfer from colostrum, not having enough to eat, having dirty or wet bedding, or any other source of stress.

Once inside the calf, the stomach acids weaken the cyst walls. After being released from the cyst, the parasites burrow into, or attach to, the intestinal walls. This incubation period for Giardia diarrhea (giardiasis) is typically about one week. The nature and severity of symptoms have been seen to vary widely from animal to animal. In addition, symptoms have a tendency to be cyclical, coming and going over a period of several weeks. For some heifers, this may be a self-limiting infection as they build resistance to the parasite. Unfortunately, somewhere between 30% and 50% of animals may develop a chronic infection lasting typically seven or more weeks.

Recovery and Treatment

The majority of heifers will recover spontaneously from giardiasis because they have a very strong immune system and the challenge is relatively low. The time for a heifer to develop immunity so that the infection is self-limiting may exceed 100 days. Thus, a

substantial minority is likely to develop chronic diarrhea that may last for seven or more weeks.

The most cost-effective methods of control once the parasite is identified among calves are excellent colostrum management and good nutrition. These best management practices create a strong immune system capable of fighting off the *Giardia* pathogen.

Nevertheless, some calves will develop an infection if the exposure level is sufficiently high. “Benzimidazoles (fenbendazole, albendazole) have been shown to be effective in elimination of *Giardia* from confined and range calves.” (Olson, p4) Olson notes that, “Although these agents are highly effective, reinfection frequently occurs if the sources of environmental contamination are not eliminated.” **It is important to remember that cyst shedding does not stop when diarrhea symptoms end.**

References: Olson, M. E. “Zoonotic protozoan parasites in cattle: emerging issues” in Proceedings of 23rd Buiatrics Congress, Quebec, CA, 2004. Trout, J and Others, “*Giardia*” USDA EMSL Reports. O’Hanley R.M. and Others, “Duration of naturally acquired giardiasis and cryptosporidiosis in dairy calves and their association with diarrhea.” J. Am. Vet. Med. Assoc. 214 (391-396).