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## *Calf Note 205 – Prevalence of Cryptosporidium and Giardia on dairy farms in the U.S.*

### Introduction

The National Animal Health Monitoring System (NAHMS), a part of the U.S. Department of Agriculture, conducted a nationwide study of dairy management practices in 2014 and focused on many aspects of calf and heifer management. I've discussed some of the research findings in previous Calf Notes, #203 and #204. An interesting (and important) part of their study was to understand more about the prevalence of two pathogens that are common to young calves – *Cryptosporidium* and *Giardia*. In this Calf Note, we'll take a look at the results of this important study.

Before we begin with the results of the survey, we need to understand a little about the two organisms monitored by NAHMS, *Cryptosporidium parvum* and *Giardia duodenalis*. Most calf raisers have heard of *C. parvum* (also known as "*Crypto*"), though *Giardia* may be new to many readers. Both of these organisms are protozoa that live in the intestine of animals, particularly young calves. Both are capable of causing diarrhea, by slightly different mechanisms in the animal. Both organisms can also infect humans, so they're a health risk to people as well as to calves. There are no drugs that are approved in the U.S. to treat either organism, so they are difficult to treat and both are important economically because of reduced calf growth, poor efficiency, and, in some cases, calf mortality. The NAHMS study monitored the prevalence of *Crypto* and *Giardia* in fecal samples and then related their prevalence to various management factors to help us understand what factors influence their prevalence on the farm.

### The Research

The NAHMS study was a large survey of management on dairy farms conducted in 2014. It included a calf component, which collected data from 104 dairies in 13 states. The study focused on important management factors from birth to weaning. In the study, researchers collected fecal samples from 2,249 calves. The samples were evaluated for the presence of *Cryptosporidium* oocysts and *Giardia* cysts, which indicate an active infection. Researchers focused on preweaned calves, as they are most susceptible to infection by these organisms. The average age of calves was 22 days, and ranged from 3 to 66 days. Only one sample was collected from each calf. The researchers then compared prevalence (proportion of fecal samples that were positive for one or both of the organisms) with management factors on the farm and calf factors such as whether the calf had failure of passive transfer.

### The Results

Overall, *Crypto* and *Giardia* were found in 43.1% and 30.5% of the fecal samples evaluated. This percentage was high and indicates that both of these organisms are very significant parasites in young calves. The economic implications of these findings are important.

*Crypto*. The prevalence of *Cryptosporidium* was greater in large farms (>500 cows) compared to small farms (30-99 cows). *Crypto* was also more likely to be found in summer compared to winter months – the researchers used temperature-humidity index (THI) as an index of heat stress and found that prevalence was greater when THI was >70 (summer) compared to a THI <20 (winter). This observation is logical, as freezing is one method that has been shown to reduce (not eliminate) the infectivity of oocysts (eggs) of *Cryptosporidium parvum*. Since oocysts are transmitted by calves consuming oocysts (usually fecal contamination), it's possible that it's more difficult to transmit oocysts in winter, possibly when manure is frozen. The research also reported that younger calves were more likely to be infected compared to older calves. Figure 1 shows the dramatic decline in proportion of fecal samples that were positive for *Crypto* at various ages. Almost 2/3 of all samples collected by the researchers in calves 3-13 days of age were positive for *Crypto*. It seems likely that fewer older calves were shedding the oocysts because they were infected at a younger age and developed immunity to the organism.

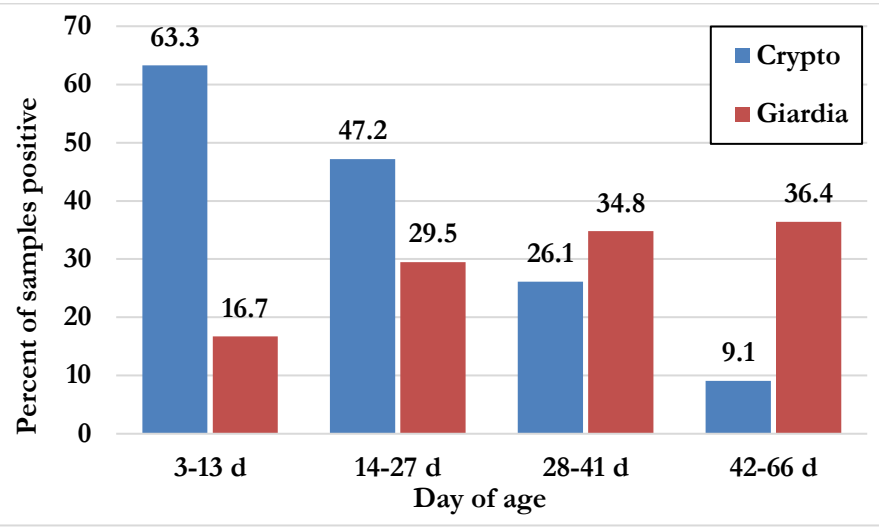


Figure 1. Percent of fecal samples positive for oocysts of *Cryptosporidium parvum* or cysts of *Giardia duodenalis* by age of calf. From Urie et al., 2018.

In my experience of visiting dairy farms around the world, a very common comment is that calves experience a transient diarrhea starting at 7-10 days of age and lasting for about 3-5 days. I call it the "10 day scours". The data in the study by Urie et al. (2018) provides good evidence that a big proportion of these scours are likely caused by infections with *Crypto*. I wrote about another study (also conducted by NAHMS) and the prevalence of *Crypto* in Calf Note #102. Since our tools to control the infection are so limited in calves that already have the infection, it's very important to focus on preventing an infection. There are a number of links at the bottom of this Note that describe some prevention measures. Generally, however, it's key that we focus on sanitation of the environment where the calf is born and where it will live until weaning. *Crypto* oocysts are shed in the feces of infected animals and must be consumed by the calf to cause an infection. Thus, if we can reduce the spread of infected fecal material, we can reduce the incidence of disease on the farm.

In a Canadian study, Trotz-Williams et al. (2007) reported several factors that were associated with *Cryptosporidium* in young calves. They found calves left with the dam for more than 1 hour were more likely to have diarrhea due to *Crypto* than calves removed immediately. The probability of diarrhea in Ontario calves is in Figure 2 and shedding of Crypto oocysts is in Figure 3, suggesting a high degree of relationship.

*Giardia*. *Giardia* was found in a smaller percentage of fecal samples compared to *Crypto* in the NAHMS study, but the overall prevalence was still substantial. Unlike the prevalence for *Crypto*,

fecal samples were more likely to be positive in older calves compared to younger ones (Figure 1). From 1 to 2 months of age, about 1/3 of all fecal samples collected were positive for *Giardia* cysts.

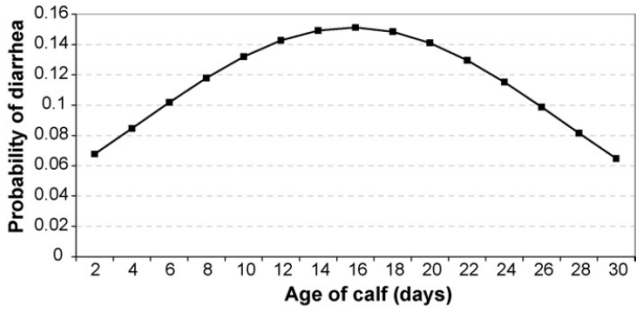


Figure 2. Probability of calves with diarrhea in Ontario dairy calves. From Trotz-Williams et al., 2007.

Other factors that were important to understanding the prevalence of *Giardia* included herd size, failure of passive transfer status and average daily gain. *Giardia* was more likely to be found in smaller herds and more often when calves had failure of passive transfer. This observation suggests that cows produce colostrum containing antibodies against *Giardia* and these antibodies can reduce infection by the organism. The other factor that the researchers found to be correlated with *Giardia* in the feces was average daily gain of the calf. Calves that were positive for *Giardia* had lower ADG compared to negative calves. *Giardia* tends to be more of a chronic type of infection compared to *Crypto* and the length and severity of infection could be responsible for the lower ADG in calves infected with *Giardia*.

**Summary**

The NAHMS study provides conclusive evidence that both *Crypto* and *Giardia* are common pathogens on most dairy farms. *Crypto* is more common in young calves, and is found more often in the summer compared to the winter. Both organisms are both resistant to common disinfectants, drying, heat and cold. A lack of drugs to treat the infections also raises challenge for control. The data presented in this research article point out clearly the need to be diligent – obsessive – in providing a clean, dry environment for young calves and to minimize the risk of transmission of disease by passing fecal contamination from calf to calf.

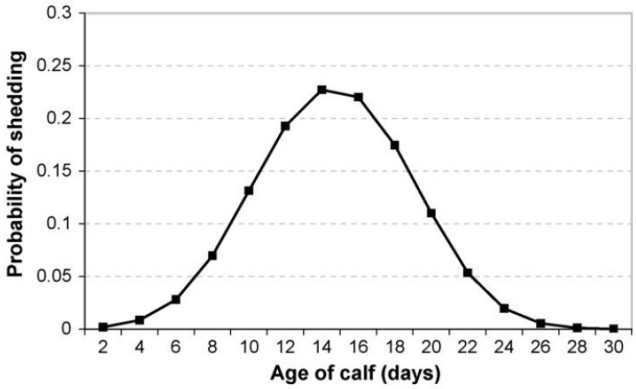


Figure 3. Probability of shedding *Cryptosporidium* oocysts in Ontario dairy calves. From Trotz-Williams et al., 2007.

Some resources for control of *Cryptosporidium* are available online:

- Bovine Veterinarian, 2015
- Calving Ease, March 1998
- The Cattle Site
- Hoard's Dairyman, 2010

- Merck Vet Manual (in depth review)
- Farmers Weekly, 2018

**References**

Trotz-Williams, L. A., S. W. Martin, K. E. Leslie, T. Duffield, D. V. Nydam, and A. S. Peregrine. 2007. Calf-level risk factors for neonatal diarrhea and shedding of Cryptosporidium parvum in Ontario dairy calves. Prev. Vet. Med. 82:12–28.

Urie, N. J., J. E. Lombard, C. B. Shivley, A. E. Adams, C. A. Kopral, and M. Santin. 2018. Preweaned heifer management on US dairy operations: Part III. Factors associated with *Cryptosporidium* and *Giardia* in preweaned dairy heifer calves. J. Dairy Sci. 101:9199–9213.