

DAIRY VETERINARY NEWSLETTER

March 2022

Cryptosporidiosis in Dairy Calves - New Research and Some Interesting Conclusions

There have been several recent publications in refereed scientific journals and dairy popular press regarding cryptosporidiosis in dairy calves. *Cryptosporidium* spp. (diarrhea is nearly always caused only by *C. parvum*) are a cause of enteritis in young calves, and are one of the most common enteric pathogens of young bovines in the world. “Crypto” is likely the single most common cause of diarrhea in young dairy calves in the U.S., causing subclinical infections as well. We always need to remember that this is also an important zoonosis that can infect humans.

A review/meta-analysis paper summarizing results of 41 studies of calf diarrhea in 21 countries was published by M. Brunauer et al. in *Animals*, April 2021. 12,208 calves from over 2100 herds were tested for enteric pathogens in these combined studies. Using online databases, papers containing specific terms (e.g. “calf diarrhea” as well as many others) were reviewed by the authors. The paper describes numerous complex statistical methods intended to combine data from multiple papers into a “weighted-stratified random-effects meta-analysis.” Studies were included only if at least two herds were used, and data was collected between 1978 and 2019. Calves were studied between birth and 60 days old, but the authors acknowledged that most cases of diarrhea would occur during the first 30 d of life.

Cryptosporidiosis is the most common calf diarrhea agent in North America and worldwide

Brunauer et al. found that the most common etiology of calf diarrhea was bovine rotavirus combined with cryptosporidia (BRV-Crypto). (No results of only one agent were presented; all were BRV combined with another pathogen.) Prevalence of BRV-Crypto was 6.7% worldwide (6.1% among dairy calves), while all other pathogen combinations had prevalence < 3%. North American mean BRV-Crypto prevalence was 6.6%, was similar to the world average, while West Asia had 16.6% prevalence and Africa had 0.6% prevalence reported. Prevalence of BRV-Crypto increased steadily over time from 1978-1980 (2%) to 2011-2019 (9%).

Interestingly, the relationship between diarrhea in calves and a diagnosis of cryptosporidiosis was more absolute than anything I have observed when testing fecal samples from a mix of healthy and diarrheal calves. Weighted mean prevalence of diarrhea within cryptosporidia fecal diagnostic result categories: BRV-Crypto positive 9.4% (significantly above the mean, $P < 0.01$), unclear/not specified 5.3%, normal (not detected) 0.0%.

Age distribution of crypto detection in calf feces was surprising

Most common ages for detection of cryptosporidia in calf feces were:

- 7-14 d old (9.3% prevalence, most had diarrhea)
- 7 d (9.0% prevalence, most had diarrhea)

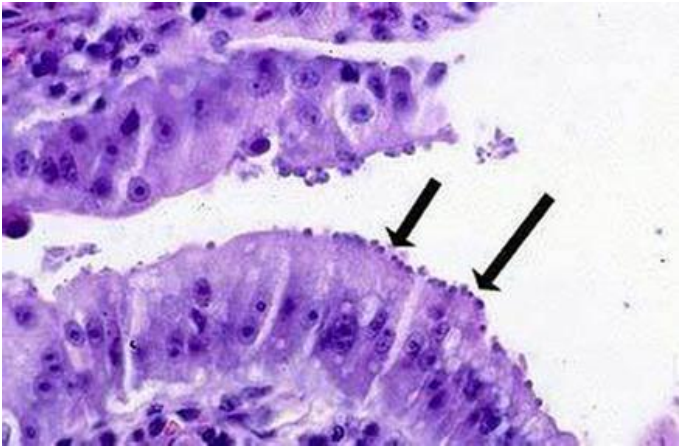
- 42-49 d old (7.8% prevalence, few had diarrhea); this rebound in fecal-positives for crypto in older calves was surprising

Diagnostic method used was associated with the prevalence of cryptosporidiosis detected

Proportion of diagnostic methods used to test for cryptosporidia were: Acid-fast stain (33%), Lateral flow immunochromatographic assay (25%), ELISA (1%), or combined diagnostic methods (41%), mainly combinations of the above, but sometimes including electron microscopy, polyacrylamide gel electrophoresis, fluorescent antibody or immunohistochemistry methods. Proportions of types of samples collected were: fecal (99%) and fecal/necropsy combined (1%).

Diagnostic method(s) used and detection of cryptosporidia in calf diarrhea samples:

- Lateral flow immunochromatographic assay 13.5% positive
- Combined diagnostic methods 12.2% positive
- Acid fast staining 3.4% positive (significantly below the mean, $P < 0.01$)
- The authors stated that acid-fast staining of fecal samples was considered less sensitive than newer methods



Cryptosporidium parvum oocysts invading the peripheral intestinal wall in a calf



Classical appearance of cryptosporidiosis diarrhea in a calf including flecks of frank red blood (not always seen)

Treatment of cryptosporidial calf diarrhea

An article by M. Hanson in Bovine Veterinarian, February 2022 summarizes some other recent studies on cryptosporidiosis. A link to a bulletin by R. Hodges from Kansas State University (bit.ly/3FSJVEs) is included. That bulletin contains a nice summary about crypto, and states, "There is no [effective] or approved treatment for cryptosporidiosis. Morbidity is high with this disease but mortality is generally low. However, calves do need intensive supportive care. Sick calves - - need fluid therapy to counteract and prevent further dehydration as well as electrolytes to replace those lost due to diarrhea. - - A recent study showed no clinical benefit to administering decoquinatate as a preventative treatment for cryptosporidiosis. (Moore, D.)"

There is also a link (bit.ly/3FKWTUG) to a paper by A. Conceição et al. in Arquivo Brasileiro de Medicina Veterinária e Zootecnia, February 2021, reporting on a study from Brazil. From 35 dairy calf farms (Dutch and Crossbreed Dutch breeds), fecal samples were collected from 385 calves aged from neonatal to 10 mo old. Centrifugal sedimentation in formaldehyde, modified Ziehl-Neelsen staining and microscopic examination on slides for oocysts was the diagnostic method. *Cryptosporidium* spp. were detected in 99/385 (26%) calves. There were no significant differences in crypto prevalence among calves from 1 - 30 d, 31 - 60 d, or 61 - 300 d old, or

in prevalence of diarrhea (130/385, 33.8% overall) among calves that were positive or negative for cryptosporidia. However, from a survey “applied to the farm owner”, risk factors for cryptosporidiosis were evaluated.

Farm characteristics that were risks for increased likelihood that calves were positive for cryptosporidiosis were:

- contact with goats and sheep (no analysis of contact with only goats or only sheep was described)
- semi-intensive rearing system (no definition of what this meant)
- poor hygiene (hygiene was reported as Yes or No on producer questionnaire, no further description)

The Hanson article linked to another paper by J. Brainard et al. in Parasitology Research, September 2020 (bit.ly/33UX6Y8). This was another meta-analysis from England, using online databases. Authors searched for papers containing many terms, a few of which were: “*Cryptosporidium*”, “calf”, “dairy”. 14 studies of calves < 4 mo old were selected. Diagnostic tests were ELISA, PCR, immunofluorescence microscopy or contrast microscopy. Numbers of herds (1 to 119) and calves (63 to 2249) varied considerably between the studies. Prevalence of *C. parvum* was mostly between 30% and 78% of calves. The review was not focused on diarrhea, but on fecal positive or negative results for *C. parvum*, which may account for the numerous results that one might not expect:

An interesting and extensive list of factors were found not significantly associated with crypto shedding, some of which were: calf birth weight, fat or protein intake, dystocia, navel disinfection, sex of primary caretaker, dehorning, bacteria count or pasteurization of “liquid feeds”, “bottle-bucket-bar or other types” of feed delivery to calves, milk replacer vs. milk fed, Holstein vs. Jersey, or individual vs. group housing. As I read this paper, I found myself asking what factors were significantly associated with risk of crypto shedding? Some were detected, described below.

Prevention of cryptosporidial calf diarrhea - flooring and bedding

Several studies considered flooring, but concrete flooring was different than earth or gravel under calves:

- One study found calves on concrete vs. earth or gravel were 3.3 times as likely not to shed *C. parvum*
- One study found calves on concrete vs. earth or gravel were 1.7 times as likely not to shed *C. parvum*
- The authors speculated that the reason was that concrete was easier to clean

One study evaluated bedding depth, compared with only 0-2 inches of bedding:

- Calves bedded 2.4” to 4” deep were 3 times as likely not to shed *C. parvum*
- Calves bedded 4.5” to 6” deep were 12 times as likely not to shed *C. parvum*
- > 6” of bedding provided no additional benefit in prevention of *C. parvum* shedding
- In some other studies, bedding type alone was not found related to cryptosporidia shedding
- (None of the bedding studies evaluated straw, a common and often recommended bedding in the U.S.)

Prevention of cryptosporidial calf diarrhea - housing

Two studies addressed housing being empty before introduction of new calves, and how close a calf was to any other calves. The “empty” period was defined as 0-9 d, which seems odd, because “zero” d was included as being empty between different animals; there must have been some clean out period less than a full day, moving hutches, etc. between calves in the 0 d housing. I would also have been interested to see comparisons between different time intervals of days empty between calves.

Compared to housing being used continually between calves:

- Calves in housing that was empty between calves were 2.5 times as likely not to shed *C. parvum*

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Compared to calves housed in close contact with other calves:

- Calves that were housed “far” from any other calves were 5 times as likely not to shed *C. parvum* (the distance that qualified as “far” was not described)

There were certainly some interesting and sometimes surprising results in these papers. The authors should be commended for delving into this complex and important cause of calf diarrhea.

UVMA Summer CE Conference June 9 - 11, 2022

The Utah Veterinary Medical Association is planning to host a continuing education conference for veterinarians and veterinary technicians. It will be in Park City, Utah from Thursday June 9 through Saturday June 11, 2022. The schedule is not yet complete, but most of it as well as registration information can be found at: <https://utahvma.org/annual-conference/schedule/>

If you know of other CE events or conferences of interest to dairy veterinarians, please let me know and I will publicize them.

Please let us know your comments and suggestions for future topics. I can be reached at (435) 760-3731 (Cell), or David.Wilson@usu.edu.

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