What Causes Diarrhea in Calves?

Diarrhea is a major health challenge in the veal, dairy, and dairy-beef industries. It directly impacts productivity and accounts for more than half of all calf mortality occurrences on calf raising farms. To better understand how to prevent this disease, we first need to think about how it occurs.

How Does Diarrhea Happen?

Diarrhea is caused by a number of factors. It does not occur just from being exposed to pathogens. In fact, some calves won't develop diarrhea, even if they have been infected with a pathogen! **So, what else contributes to whether a calf will develop diarrhea or not?**

HEALTHY GUT

It all has to do with the immune system of the calves and the presence of **healthy bacteria** in the gut that will help protect calves against the effects of pathogens.

Ensuring the calf has a variety of protective "good" bacteria in the gut is the name of the game[1].

Increased numbers of "good" gut bacteria can be achieved by feeding calves an ample amount of colostrum quickly after birth (4 L of good quality colostrum within the first 4 hrs) and providing a high plane of milk nutrition (8-12 L/day by the second week of life).

VS

UNHEALTHY GUT

Sub-optimal management of calves (i.e., low volumes of colostrum (< 3 L of colostrum at first feeding) and milk (< 5 L of milk per day); feeding antibiotics in milk) in early life can result in challenges when it comes to the development of gut bacteria in calves[2].

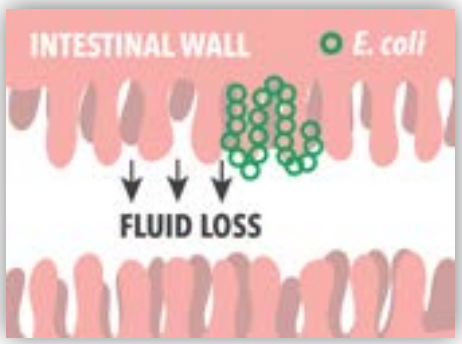
This leads to the presence of certain "bad" bacteria in their gut and a reduction in the diversity of gut bacteria.

The combined effect of "bad" bacteria and reduced gut bacterial diversity leads to an increased chance of diarrhea when bacterial, viral, or parasitic pathogens are present in the environment and cause infection in calves.

What Major Pathogens Cause Diarrhea?[3]

Enterotoxigenic *Escherichia coli* (*E. coli*)

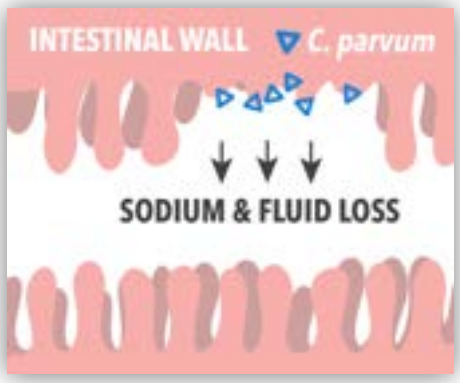
Enterotoxigenic *E. coli* is responsible for causing diarrhea in the first 4 days of life but is not associated with diarrhea in older animals. Calves can get infected with this pathogen when it is ingested from the environment right after birth.



1. *E. coli* bacteria are ingested and attach to the intestinal walls.
2. Fluid is secreted into the intestines.
3. High fluid loss in feces leads to rapid dehydration.

Cryptosporidium parvum (*C. parvum*)

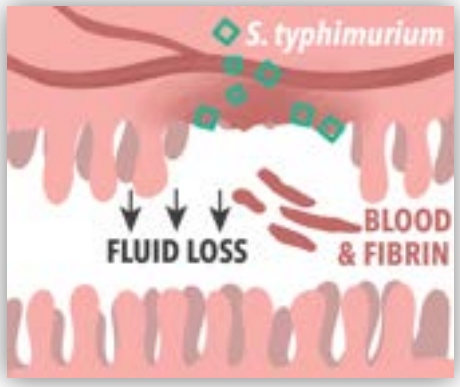
C. parvum is a parasite that is commonly found in dairy calves. Similar to Enterotoxigenic *E. coli*, infection occurs when calves ingest the pathogen from the environment. Environmental contamination will come from feces of other infected animals, such as other young calves which shed the parasite in peak quantities at 2 weeks of age. Adult cattle also shed it in their manure. *C. parvum* is also a zoonotic pathogen, meaning that it can infect humans.



1. *C. parvum* parasites are ingested and damage intestinal villi.
2. Damaged villi can not properly absorb nutrients, leading to malabsorptive diarrhea.
3. During malabsorptive diarrhea, sodium and fluid are lost in feces. Glucose and carbohydrates in the intestines also pull fluid into intestines, further contributing to fluid loss.
4. Prolonged malnutrition negatively impacts calf growth rates.

Salmonella typhimurium (*S. typhimurium*)

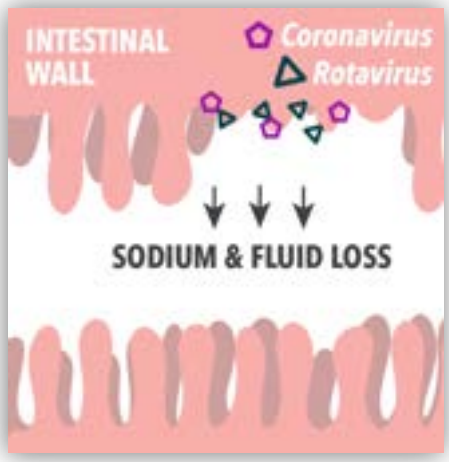
Salmonella typhimurium affects calves that are less than 3 weeks of age. It is also important to note that this bacteria can cause disease in humans as well.



1. *S. typhimurium* bacteria cause severe intestinal damage.
2. Calf develops watery diarrhea with blood and fibrin present in feces.
3. Severe intestinal damage allows bacteria to travel into bloodstream. This can result in severe disease in calves with very elevated temperatures and depression.

Rotavirus & Coronavirus

Rotavirus is one of the most common causes of diarrhea and predominantly affects calves between 1 to 2 weeks of age. Calves can become infected when they ingest the virus from feces that has contaminated the environment. Coronavirus is another common pathogen that is responsible for causing diarrhea in calves that are 1 to 2 weeks of age.



1. Rotavirus and coronavirus are ingested and damage intestinal villi.
2. Damaged villi can not properly absorb nutrients, leading to malabsorptive diarrhea.
3. During malabsorptive diarrhea, sodium and fluid are lost in feces. Glucose and carbohydrates in the intestines also pull fluid into intestines, further contributing to fluid loss.
4. Rotavirus will be shed into the environment, with peak shedding at 5-7 days after infection. Shedding to the environment can spread infection to pen mates.

Take Home Messages

Diarrhea is a very common disease that affects calves in early life. If calves are not set up for success, being exposed to parasitic, viral, or bacterial pathogens can lead to diarrhea. It is critical for calf managers to reduce the amount of these pathogens in the environment to help protect against disease.

How we manage calves, especially with respect to colostrum and milk feeding, can help set up the gut to protect against the development of diarrhea.

Work with your veterinarian to develop a strategy to mitigate the consequences of diarrhea on your farm.

References

1. Ma, T., C. Villot, D. Renaud, A. Skidmore, E. Chevaux, M. Steele, and L. L. Guan. 2020. Linking perturbations to temporal changes in diversity, stability, and compositions of neonatal calf gut microbiota: prediction of diarrhea. The ISME Journal. 14:2223-2235.
2. Fischer, A.J., C. Villot, J.K. van Niekerk, T.T. Yohe, D.L. Renaud, and M.A. Steele. 2019. Nutritional regulation of gut function in dairy calves: From colostrum to weaning. Applied Anim Sci. 35:498-510.
3. Cho, Y., and K. Yoon. 2014. An overview of calf diarrhea: infectious etiology, diagnosis, and intervention. J Vet Sci. 14:1-17

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