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# Science & Solutions

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# Calf Health for Tomorrow's Profits

## Colostrum to Combat Diarrhea in Calves

Photo: fotolia.com

## What's Wrong with My Herd?

Displaced abomasum

# Editorial

## Underlying Challenges Impact Herd Performance

Clinical cases of disease are often referred to as the 'tip of the iceberg' as they present the visible signs in an affected animal and therefore make their presence known to producers. Much like the iceberg, with the majority below the surface, not all afflicted animals present clinical disease, leaving a 'silent' population within the herd and influencing production.

Although economic losses are much more apparent when clinical cases of disease are present, subclinical infections also contribute to reduced animal performance such as: limiting calf growth, decreasing milk yield, and reducing milk quality. Reducing the prevalence of subclinical infections will help reduce clinical events and also improve production efficiency—which is especially crucial during times when milk prices are low.

In this issue of **Science & Solutions**, we touch on several topics that can be influenced by subclinical disease. Raising healthy calves is important for the future success of the herd and this process begins with a healthy cow and quality colostrum. Endotoxins play a role in all Gram-negative bacterial infections, whether it's scours caused by *Salmonella* or mastitis caused by *Escherichia coli*. In addition, the subclinical metabolic disease, subacute ruminal acidosis (SARA) has major implications on endotoxin production and has been associated with subsequent issues including hoof health problems and liver abscesses.

Many overt challenges are encountered while working to raise healthy livestock, but it's important to keep in mind those underlying issues which may be affecting the herd. Producers work hard to overcome these challenges to produce wholesome products. I hope you will pour yourself a glass of milk or add some creamer to your coffee while you enjoy this latest issue of **Science & Solutions**!



**Dr. Paige GOTT**
Ruminant Technical Manager

# Contents




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Photo: Hillview11

# Improving calf health

By **Luis Cardo** DVM, Ruminant Technical Manager,
and **Rikke Engelbrecht** PhD, calf advisor at Western Union of Agricultural Services in Denmark

Tackling pre-weaning mortality through better gut performance can lead to improved calf health and future profits.

# in Denmark

Dairy calves, the cornerstone of any dairy farm, have long been overlooked. Pre-weaning mortality is a major issue in dairy farming around the world. US data (NAHMS, 2007) found a mortality rate for heifers of 7.8%, with digestive problems being responsible for 56.5% of those losses, with respiratory problems being responsible for another 22.5%. These figures are strikingly close to those reported in 1992, highlighting a lack of improvement in the last 20 years. Respiratory and digestive problems are correlated, as the occurrence of one will increase the chances of the other. Considering average herd replacement rates around 30% these are figures severely limit a dairy producer options.

This article originally appeared in Dairy Global

## Economic costs

There is a strong correlation between pre-weaning ADG and milk production. A meta-analysis of more than 10 studies concluded that each extra 0.4 kg of pre-weaning ADG should deliver an extra milk yield during first lactation of 621 kg. Even more, each diseased heifer represents a huge economic burden: one Dutch

# Each extra 0.4 kg of pre-weaning ADG should deliver

***Figure 1.*** Average daily gain (g).

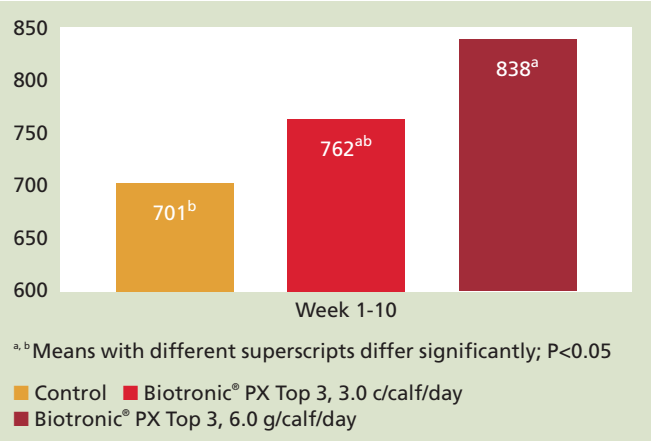
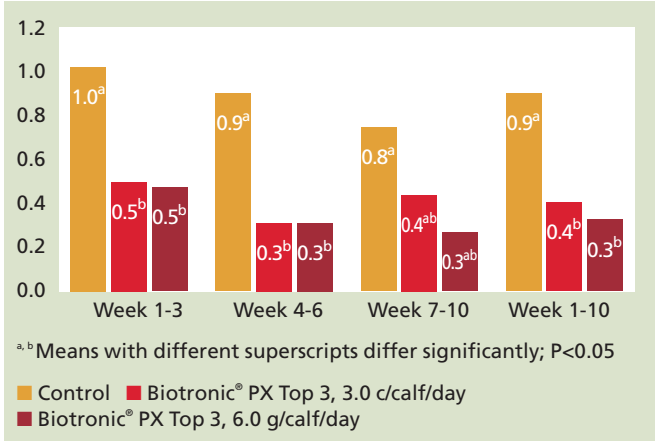



***Figure 2.*** Faeces consistency scores.




study reported that the rearing costs of a heifer that experienced disease at least once were on average €95 (US$105) higher compared to healthy heifers.

## Preventing gut disorders

Digestive disorders are produced through a vast array of causes, infectious or not. Good management starting from an adequate colostrum supply (in timing, quantity and quality) is essential and milk supply should always be checked with regards to its consistency, hygiene, temperature, delivery method and quality.

Other points not to be neglected are the water supply, the concentrate and roughages supply, adequate sheltering and a non-stressful environment, with special attention paid to the moment of mixing calves or to calves kept in groups.

## Pathogen challenge before weaning

In practice, a dairy calf will face real pathogen challenges before weaning. Farms, because of existing facilities, feedstuffs and bedding often suffer from high infectious rates. Viruses, protozoa and bacteria are often causes of diarrhea and mortality, with bacteria being the greatest threat, either as a primary cause or secondary to any other factor, including management mistakes or other effects of other pathogens.

The most common diarrhea causing bacteria are *E. coli* and *Salmonella spp.*, Gram-negative bacteria that are showing increased resistance to different antibiotics, making treatment increasingly difficult and raising concerns about possible implications for human health.

## Commercial trial in Denmark

The trial was performed on a large commercial dairy farm in Denmark where the herd is mixed breed based on Holstein and Jersey cattle. The farm milks over 1300 dairy cows and raises all replacement heifers. Calves are kept in outdoor single hutches for 2 to 3 weeks after which they are moved into super-hutches, also outdoors, with a group size of 5 or 6.

The herd is *Salmonella* Dublin positive, and part of a national eradication program. Diarrhea outbreaks are often diagnosed at the farm.

## Trial set-up

The trial ran for a 3.5 month period during the summer, with 18 calves as a control group and 2 trial groups numbering 20 and 18 calves, respectively,

**Luis Cardo** DVM, Ruminant Technical Manager at Biomin,
& **Rikke Engelbrecht** PhD, calf advisor at Western Union of Agricultural Services in Denmark

an extra milk yield during first lactation of 621 kg.

***Figure 3.*** Nasal discharge scores.

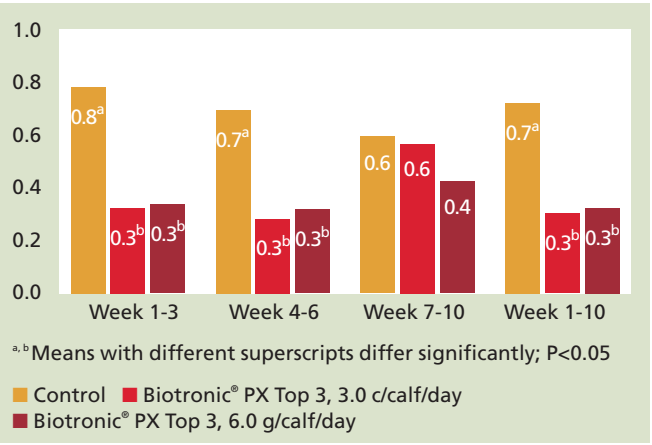
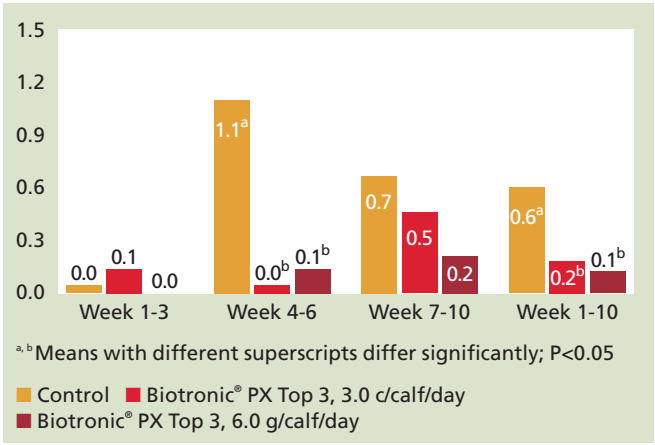



***Figure 4.*** Coughing scores.




receiving different dosages of an organic acid-based product, Biotronic® PX Top3. Trial duration was approximately 70 days on average for each calf. Data regarding body weight gain (BWG) was collected and average daily gain (ADG) calculated. Cough, nasal discharge, ocular discharge, ear and head carriage and rectal temperature were scored according to the University of Madison guidelines. Feces consistency was scored weekly according to standard protocol. All calves enrolled in the trial were moved within 1 hour after birth to a clean and well bedded hutch, birth body weight showed no statistical differences between groups and was approximately 40 kg. All calves received 4 L of good quality colostrum (Brix =>22) in the first hour post-birth along with a navel iodine dipping.

All calves received 6 L milk per calf per day while in single hutches and 10 L per calf per day while in super hutches. Weaning started at 6-7 weeks depending on the hutches availability for new calves. Solid feed consisted of a textured starter with 22.5% crude protein offered free choice on a daily basis.

## Higher growth and more milk

Calves in both experimental groups outperformed the control group and showed better health. Total body weight gain (BWG) in the trial was 48.7 kg for control group and 53.3 kg and 57.6 kg for experimental groups. Average daily gain (ADG) for both experimental groups was 61 gram and 137 grams higher than control group showing statistical significance and forecasting an extra milk yield of 84 kg and 212 kg, respectively, during the first lactation (*Figure 1*). Interestingly, both experimental groups also showed better health scoring than the control group. Control group showed consistently and statistically significant looser feces and also worse health scoring, underlying the relation between diarrhea and other diseases. Experimental groups showed better growth parameters, better feces consistency and better general health, also reflected in the nasal discharge and coughing scores (*Figures 2, 3 and 4*).

## Conclusion

This trial demonstrates the potential of an innovative acid-based feed additive in reducing the negative effects of Gram-negative bacteria and improving both growth parameters and general calf health. This strategy could also help to reduce the usage of antibiotics and the potential build-up of bacterial resistances.

Photo: kadirkaplan

# Think Colostrum, Not Antibiotics,

By **Zanetta Chodorowska**, Ruminant Technical Manager

Diarrhea is the most common problem for newborn calves. Compared to antibiotics, proper colostrum management may offer a better route to calf health and profits.

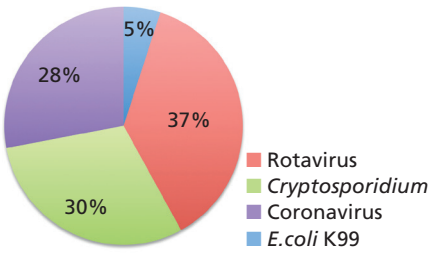
An estimated 56% of health problems in early life relate to diarrhea, making it a number one health issue for newborn calves. It accounts for 52.2% of mortality of unweaned calves, and is also a major cause of poor growth, increased labor requirements and increased costs.

In the United States, 23.9% of dairy heifers are affected by and treated for scours and preweaning mortality is estimated at 7.8% according to Cornell University and the National Animal Health Monitoring System (NAHMS, 2007), respectively.

## Not bacterial

Outbreaks of infection causing calf diarrhea are often rapid and multifactorial in nature. Major enteric pathogens known to cause calf diarrhea are viruses (*i.e.*, bovine rotavirus, bovine coronavirus (BCoV), bovine viral diarrhea virus (BVDV) and microscopic parasites (*Cryptosporidium parvum*), as shown in *Figure 1*. Bacteria such as *Salmonella* (*S.*) enterica, *Escherichia* (*E.*) *coli*, *Clostridium* (*C.*) *perfringens*, are often only secondary infection agents.

***Figure 1***. Prevalence of infectious agents.




*Source: Intervet/Schering-Plough Animal Health ScourCheck 2009*

# to Combat Diarrhea in Calves

As antibiotics are not effective against viruses and parasites, their application to counter diarrhea makes little sense. Antibiotic use in these cases has several disadvantages. First, calves who have undergone antibiotic therapy produce 492kg (1084lbs) less milk during first lactation, according to Mike van Amburgh of Cornell University and confirmed by others. Second, antibiotics destroy the normal, beneficial intestinal bacteria and thereby disrupting intestinal health. Third, destruction of Gram-negative bacteria releases endotoxins, the lipopolysaccharide components of cell walls.

According to James Cullor of UC Davis, the general effect of endotoxins are well chronicled and are reported to include lethargy, respiratory distress, transitory hyperthermia followed by hypothermia, decreased systemic blood pressure, increased heart rate followed by decreased cardiac output, diarrhea, changes in blood cell counts, and alterations in the blood coagulation system. Fourth, antibiotic use is associated with antibiotic resistance.

## A better way

Bovine colostrum offers a kind of survival kit from the mother to the newborn calf to protect against challenges at the beginning of life. It benefits the calf's immune, hormonal and digestive systems, and contains everything required for healthy, productive development along with an enormously high nutrient content.

With colostrum intake shortly after birth, in one shot the calf gets all the 97 immune factors (constituents that build the immune system), 87 growth factors (bio-identical hormones and hormone precursors) and a variety of different probiotics along with prebiotics that help grow and feed the beneficial flora in the gut. This passive immunity transfer protects the calf until it establishes its own pathogen recognition and disposal systems.

The best composition of hormones and growth factors such as relaxin, prolactin, insulin, IGF-1, IGF-2, and leptin are only available via colostrum. The beneficial contents of colostrum milking can persist

**Bovine colostrum offers a kind of survival kit from the mother to the newborn calf to protect against challenges at the beginning of life.**

***Figure 2***. Transition state colostrum remains richer than standard milk.

| | Unit | Colostrum Milking | | | | | Mature Milk |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | |
| Dry Matter | % | 24.5 | 19.0 | 16.0 | 15.5 | 15.3 | 12.2 |
| Fat | % | 6.4 | 5.6 | 4.6 | 5.0 | 5.0 | 3.9 |
| Protein | % | 13.3 | 8.5 | 6.2 | 5.4 | 4.8 | 3.2 |
| Essential Amino Acids | Mmol/L | 390 | 230 | 190 | 140 | 115 | ND |
| Lactoferrin | g/L | 1.84 | 0.86 | 0.46 | 0.36 | ND | ND |
| Insulin | µg/L | 65 | 35 | 16 | 8 | 7 | 1 |
| Growth Hormone | µg/L | 1.5 | 0.5 | ND | ND | ND | ND |
| Insulin-like growth factor I | µg/L | 310 | 195 | 105 | 62 | 49 | ND |

*Source: Hammon et al 2000. ND = not detected.*

through the fifth milking—or three days after parturition (*Figure 2*).

## Tailor-made solution

Colostrogenesis begins 3 to 4 weeks prior to parturition with the accumulation of hormones, growth factors (IGF-I and IGF-II) and transforming growth factors (TGF-β1 and TGF-β2) which activate mammary secretory cell.

Because colostrum transfers antibodies to a calf, cow breeders can essentially design colostrum for the coming calves by vaccinating cows 60-30 days before calving against the most frequent pathogens appearing on the farm. In that way, the newborn calf gets selective protection against existing pathogens in the farm environment.

Colostrum from vaccinated cows has demonstrated ability to kill bacterial and viral invaders, stimulate tissue repair (particularly the bowel lining), fight a variety of allergens and neutralize toxin-producing organisms. It has also proven effective in treating severe diarrhea. According to the 2007 National Animal Health Monitoring System survey, approximately 19% of dairy heifer calves in the US had failure of passive transfer.

## Beat the clock

Speed is crucial when it comes to harvesting and feeding colostrum to newborn calves, for several reasons. First, the composition of colostrum changes following removal of placenta. Second, newborns lack the enzymes that breakdown colostrum's active components—these are developed later.

Third, it is important to seize the opportunity afforded by the 'open gut' phenomenon, in which the upper part duodenum remains open for direct absorption of colostrum ingredients into the calf blood stream. (Note that pathogens can also enter the open gut).

## Additional considerations

Proper feeding of the cows in late lactation and dry period, can positively influence colostrum quality and quantity. Mycotoxins—found in both grains and contaminated straw—can impair immune and liver function, so robust mycotoxin risk management is advisable.

Agents that cause diarrhea are present in a calf's environment. Improvements in environmental sanitation and the reduction of stressors (e.g. overcrowding, frequent diet change, heat stress, etc.) coupled with proper colostrum management can help support healthy calves.

## Conclusion

Every calf that is born on a farm represents an opportunity to maintain or increase herd size, to improve the herd genetically, and to improve economic returns. Pathogen invasion can create additional costs, health issues and poor performance. Good quality colostrum can allow cow breeders to achieve a successful outcome.

## Tips for proper colostrum management

1. **Harvest** colostrum from a healthy dam, ideally within 2 hours after calving.
2. **Feed** colostrum at body temperature to calf just after harvest. Feed at least 3 liters at first feeding and another 2 liters within 6 hours of life. If possible also feed 6 liters on the second and third days from the following milkings.
4. **Test** with BRIX refractometer or colostrometer. The concentration of protein provides a good estimate of IgG >50g/L IgG (3-4 L will give 150-200g) tested on BRIX refractometer of >22% are indicative of high quality (high IgG).
5. **Use** clean colostrum with a low concentration of bacteria: less than 100.000CFU/ml and 10.000 coli form count.

Cut & Keep Checklist

# What's Wrong with My Herd?
# Part 3: Displaced abomasum

Today's dairy cattle are genetically prepared to produce large amounts of milk. Along with that is the requirement for the consumption and digestion of large amounts of feedstuffs. The incidence of displaced abomasums (DA) may be increasing in our dairy herds via both genetic selection for greater milk production and the shift to more energy dense diets that may have less effective fibre content. Approximately 5% of high producing dairy cows may have a displaced abomasum.

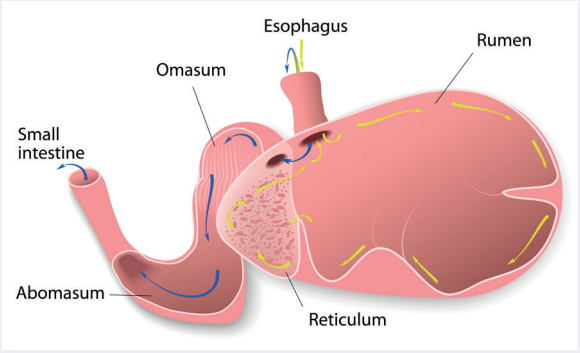


Illustration: Designua

The abomasum is the ruminant's 'true' stomach and comparable to the stomach in monogastric animals. It is not a small organ as it can contain 27 litres of fluids; however it is dwarfed by comparison to the 180+ litres in the rumen-reticulum. Located on the right side and along the bottom of the rumen, the abomasum can undergo movement or position changes due to changes in rumen fill or the size and place of internal organs.

Key to abomasal displacements are changes due to calving and feed intake. The more time the rumen remains filled, the less opportunity there is for the abomasum to shift. However, at calving there is a great void in the cow with the loss of the displaced abomasum, calf, placenta, and associated fluid. Organs shift in location and the abomasum can slip from its normal position.

Additionally, cows often have reduced feed intake associated with calving which can also make it easier for the rumen to slip from its normal position. Ketosis that occurs during the first months of lactation can also contribute to decrease feed intake and an increase in the incidence of displaced abomasum. About 80% of the DA cases occur within the first month of lactation. A 'left' displacement where the abomasum 'slides' up the left side of the rumen is the most common and accounts for 80% of displacements.

## Symptoms

The first signs are decreased feed intake, listless behaviour and a drop in milk production. The amount of faeces produced may be reduced and have more fluids than normal. The heart and respiration rates may remain fairly normal. The most diagnostic test is usually the 'ping test'. Using a stethoscope one can hear a ping as a result of thumping the area. As the abomasum is displaced, gasses tend to build as regular flow is decreased due to twisting of the duodenum. Occasionally, DA can be corrected by 'rolling' the cow or jogging the cow to encourage the organs to resume their normal position. On a practical basis, by the time a cow is observed and a DA is suspected, surgery is the likely outcome. The surgery can be done with minimally invasive techniques, but all surgery has a risk and the cow will still have a recovery period of poor production, or if treated with antibiotics, disposed milk.

## Prevention

The best prevention is consistent feed intake. Rumen fill and continuous flow of material helps maintain both rumen and abomasum in their proper position. Unfortunately, there are times when consistent intake is not possible. In addition to the issues surrounding calving, cattle can go off feed because of disease, mycotoxin challenges, and diet changes. Even weather can affect intake. Certain management decisions can reduce the interruptions to feed intake.

## Summary

Displaced abomasum are becoming more common in dairy operations as a combination of changing genetics and feeding programs. Management and feeding programs that help ensure rumen fill through good dry matter intake, yet reduce energy deficits should help reduce the number of observed displaced abomasums.

## Tips for maintaining feed intake

- Have a transition program that encourages feed intake and rumen fill. Numerous studies have demonstrated that the less a cow's feed intake drops at calving, the more quickly they will increase dry matter intake after calving.
- Encourage feed intake through the use of better quality forages.
- Consider adding yeast or yeast culture products into the ration. Yeast products can support fibre digestion and feed intake. Yeast culture products have also been used as palatability enhancers.
- Avoid ketosis while additionally maintaining this feed intake is critical to reducing both clinical and subclinical ketosis. Ketosis is known to result in reduced feed intake and explains the increases in DA associated with it. A reduction in rumen motility can also be related to DA.
- Fibre length and proportion of the diet can influence DA. A lack of fibre can result in lowered rumination and the fill to keep the rumen in its normal position. At the same time, high producing dairy cows need energy. Fibre sources that have good digestibility or the addition of yeast based products which may assist fibre digestion can help in both meeting the need for fibre and the greater energy need of these cattle.

For more information, visit **www.mycotoxins.info**

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