

Science & Solutions

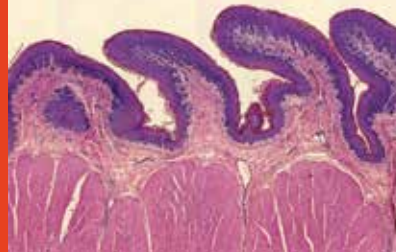
Start young

Healthy calves before
healthy profits



Phytogenics for calves

Nurture future performance by
focusing on calf health today



Rumen development

Nutrition and management
before and after weaning

Editorial

Investing in your calf

Heifer calves are the future assets of a farm. They represent an investment in the long-term profitability of dairy operations. Special attention should be paid to maintaining good health paired with high weight gains while avoiding delays in rumen development.

The digestive system of calves is not fully developed at birth. In the first two weeks postpartum, calves are monogastric with the abomasum as the only stomach compartment that is developed enough for digestion. During this time, only liquid feed can be utilized effectively.

As calves grow, grain-based starter feeds are given in increasing amounts to promote rumen development. It is not surprising that the gastrointestinal system can be easily overtaxed due to tremendous changes in the digestive tract as well as modification of the feeding pattern and feed formulation. Poor formulations accompanied by low quality milk replacers and starters may lead to undernourished calves, with adverse effects on the overall health of the animals.

Stressors originating from feed or the environment lead to an impairment of the immune system, giving pathogens easier access. This results in digestive disorders and diarrhea. A main cause of pre-weaning mortality and major medical treatment costs can be attributed to calf morbidity particularly due to diarrhea.

BIOMIN offers solutions to counter poor calf development. The application of phytogenics is one major strategy for ensuring that investments in these future cows are successful and pay off. BIOMIN has developed the Digestarom® product line to include well-formulated mixtures of plants and plant-derived substances to meet the crucial points in calf rearing.

This issue of **Science & Solutions** focuses on calf health and development. We hope our readers may gain insights into a holistic concept of proper calf management.



Carina SCHIEDER
Product Manager



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Prioritize the health status of young calves and achieve higher feed efficiencies without relying on antibiotics.

By *Carina Schieder DI (MSc)*



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Rumen development Is it *that* important?

Give your calves a good headstart with strong rumen development and early age at first calving.

By *Luis Cardo & Bryan Miller MSc*

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Editor: Daphne Tan
Contributors: Luis Cardo, Bryan Miller, Carina Schieder
Marketing: Herbert Kneissl, Cristian Ilea
Graphics: Reinhold Gallbrunner, Michaela Hössinger
Research: Franz Waxenecker, Ursula Hofstetter, Mickael Rouault
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Industriestrasse 21, 3130 Herzogenburg, Austria
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Photo: Fred Isomero



Phytogenics

for growing calves

Superior growth performance in calves requires a good health status. Minimizing morbidity and mortality and maximizing health and performance are major goals in the pre-weaning and weaning period of calves.



Good health status is a key requirement for **high weight gain** in growing calves.

Photo: chictype

Calf management is a major aspect of dairy operations. Under intensive calf management, short rearing periods with high daily weight gains are desirable goals from an economic point of view. Farmers and farm managers are becoming more aware of the advantages of intensified feeding systems that lead to better ruminal development accompanied by higher growth rates and subsequently higher milk performances in first lactations. Intensified growth programs, based on higher milk or milk replacer intakes, in combination with continuous weaning encourages starter intake in the pre-weaning period and demands accelerated early nutrition. Thus, animals are supported to achieve their genetic potential.

Health problems and their triggers

Overall, high weight gains require a good health status in pre-weaning calves. Morbidity and mortality of calves in the rearing period represent major financial losses for farmers. These parameters are connected to direct costs due to calf losses, treatments and negative long-term effects on performance.

Feed changes occurring during the first three months

Feed changes occurring during the first three months of life are major stress events affecting intestinal health and performance.

of life are major stress events affecting intestinal health and performance. Consequently, it has become a common practice to apply antibiotic growth promoters (AGPs) at sub-therapeutic levels in milk replacers and starter formulations for disease prevention. It is estimated that the exclusion of AGPs from ruminant feed increases production costs by up to 5%.

Antibiotic resistance in animal production and the risk of antibiotic residues in products of animal origin and in the environment have raised concerns among the public and scientific community. Government regulations are increasingly aimed at restricting the use of antibiotics as growth promoters or banning the use of AGPs, as in the European Union in 2006.

The exposure to various infectious agents through feed may be accompanied by various other stressors such as the environment or management. These factors consequently have a negative impact on the calf's wellbeing and health. Calfhood diseases may affect the economic viability of dairy operations with losses arising from respiratory and gastrointestinal tract diseases. The latter leads to diarrhea caused by bacterial infection in the intestine.

According to the National Animal Health Monitoring System (NAHMS) report 2010, 23.9% and 12.4% of pre-weaned heifer calves suffer from diarrhea or other digestive problems and respiratory tract diseases, respectively. More than 75% of these diseases were treated with antibiotics. Control of scours is a costly endeavor as diarrhea causes greater financial loss to dairy operations than any other disease.

All in all, securing high animal performance raises the demand for additives that can substitute for or even exceed the positive effects of AGPs on feed efficiency and disease prevention without further arousing public concern. Several alternatives may be applied to improve health. Among the alternatives are phytogenics which represent a group of plant-derived products, including a variety of promising substances that enable calves to achieve their full genetic potential while improving overall health.

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A natural and effective solution

An increasing number of scientific literature have demonstrated the efficacy of phytogetic substances on growth and feed efficiency in various animal species. Phytogetics, also referred to as botanicals or phytobiotics, have been used for medicinal purposes in humans and animals for centuries.

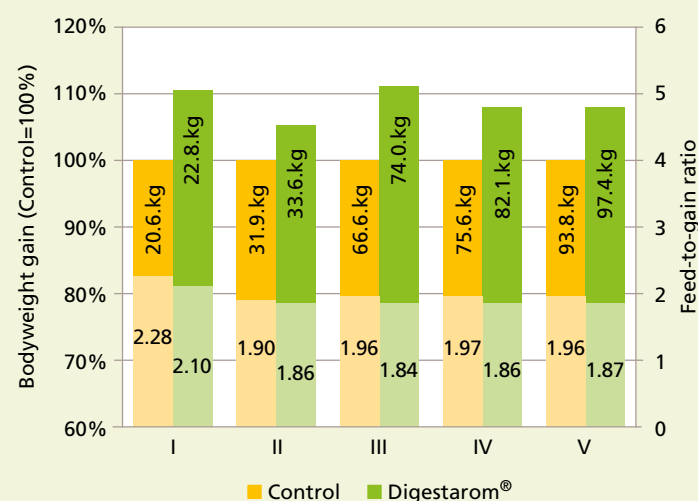
Botanicals contain secondary plant metabolites with diverse positive influences on the health of animals. Besides sensory effects influencing palatability, phytogetic feed additives stimulate the production of saliva and gastric juices and exert great anti-inflammatory, anti-microbial as well as anti-oxidative activities.

The positive influence of phytogetic feed additives on zootechnical parameters particularly of broilers and pigs has been cited in an increasing number of literature. With regard to calves, published scientific research data is still limited.

The Digestaron[®] product line contains a defined and standardized mixture of grounded herbs and spices, volatile (essential oils) and non-volatile compounds. The efficacy of the Digestaron[®] product line for calves on performance and feed efficiency is proven in various field trials.

Figure 1 displays the results of five trials. Overall, body weight gain was higher by 8%. Feed efficiency improved by 5% on average across the five trials, so

Figure 1. Effect of Digestaron[®] (DG) on bodyweight gain and feed efficiency in different trials.



Trial I: Miller *et al.* (2011) – DG in CMR vs. CMR, 54 vs. 53 calves/group, 6 weeks

Trial II: Chester-Jones *et al.* (2010) - DG in CMR vs. Neo/OTC in CMR, 24 vs. 26 calves/group, 8 weeks

Trial III: Friedrichkeit (2011) – DG in CMR/starter vs. CMR/starter, 25 vs. 25 calves/group, 8 weeks

Trial IV: Friedrichkeit (2012) – DG in CMR/starter vs. CMR/starter, 27 vs. 26 calves/group, 8 weeks

Trial V: Bahlmann (DE) – DG in CMR vs. CMR, 5 consecutive trials, 21 weeks each



A choice blend of phytogetic ingredients would contain a well-balanced combination of bioactive ingredients. Together, they exert anti-inflammatory, anti-oxidative and anti-microbial activity, enhancing growth and ultimately farm profitability.

that calves receiving Digestarom® required only 1.91 kg of feed per kg bodyweight gain compared to 2.01 kg of feed for the control groups that received no supplementation.

Good health status

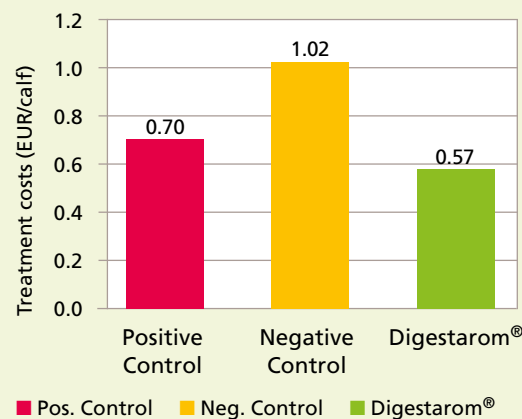
Maintaining healthy calves is essential for calf development and growth. Good health status is a key requirement for high weight gain.

A trial conducted at the University of Minnesota demonstrated that medical costs were lowest for the Digestarom® group compared to the positive (Neomycin and OTC, Rumensin) and negative controls (Figure 2). The Digestarom® group also had higher weight and improved overall health status with lower disease incidence.

Differences in treatment costs in the trial were remarkable: Expenses due to medical treatments were slightly above EUR1.00 per calf in the negative control group. Treatment costs were reduced to EUR0.70/calf for the AGP group. For the Digestarom® group, treatment costs were even lower at EUR0.57/calf.

These results confirm the potential of Digestarom® as a powerful tool for stabilizing the digestive system due to its anti-inflammatory, anti-oxidative and anti-

Figure 2. Effect of Digestarom® on treatment costs in comparison to the positive and negative controls.



Source: Chester-Jones et al., 2010

microbial efficacy. Its strong influence on digestibility reduces intestinal challenges and creates a more stable gut microbiota.

Starting right

Adequate growth rates and excellent ruminal development are the basis for raising healthy calves that eventually mature into high performing cattle. However, calf-hood diseases, mainly arising from bacterial challenges in the intestinal tract, greatly impact the economic viability of dairy farms due to significant medication costs. As a result, AGP supplementation is still a common practice in many countries.

Due to rising concerns over the use of antibiotics in animal production, phytoGenics are gaining considerable interest. Positive trial results on growth performance, feed efficiency and health status have shown that phytoGenic supplementation reduces the need for antibiotics. The results obtained are excellent indicators of the potential of phytoGenic additives and should encourage further research in this field.

References are available on request.

*Positive trial results on growth performance, feed efficiency and health status have shown that phytoGenic supplementation **reduces the need for antibiotics.***

Rumen development Is it *that* important?

Profitable dairy production is based on well-developed heifers capable of fulfilling their genetic potential at an **early age at first calving**.

Achieving this goal requires a comprehensive approach that includes early starter feed intake for optimal rumen development.

Photo: The Royal Veterinary College, University of London

R

umen development has become a focus of attention in the rearing of heifers due to the effect it has on final profitability. Achieving optimal early rumen development will reduce the rearing costs of heifers through better feed efficiency and earlier calving.

Research has demonstrated a strong correlation between early age at first calving (AFC) and increased lifetime milk production. Earlier calving is strongly correlated with greater lifetime production, even if first-lactation milk yield may be reduced because body weight at first calving is lower than recommended (*Table 1*).

According to the National Research Council (NRC) weight at first conception and AFC should represent 55% and 82% of the final mature body weight respectively, with an optimal age at first calving around 22 months. To achieve these tar-

gets, comprehensive planning on nutrition and management must be established from the moment of birth.

The absorptive layer in the rumen is the papillae-containing epithelium. It is important that this layer develops first; the muscular layer can be developed later. The primary stimulus for epithelial development is volatile fatty acids (VFA). Butyrate in particular, and to a lesser extent propionate, is the chemical driver for this development.

Should hay be fed to calves?

Feeding hay prior to weaning is a common practice worldwide. This is based on the “scratch” effect that supposedly helps the rumen develop. However, epithelium development is driven by chemical and not physical factors that are in fact not very important. This is because the acetate produced by forage fermentation is



When to wean?

A calf should not be weaned before it is prepared to live on solid feed without milk. As a rule of thumb, the calf should eat at least 1 kg of starter consistently (i.e., at least for 3 days in a row).



Depending on farm management, this stage can be reached at different ages. Some basics to accelerate calf readiness are: offering starter as soon as possible (within the first week of life), ensuring optimal starter palatability, offering water *ad libitum* or at least after meals (even if the weather is cold), and postponing forage offering.

Table 1. AFC and average total milk production.

Age Years	AFC treatments, months				
	23.3	24.3	25.6	27.2	30.3
	Average total milk production, kg				
3	8,960	8,382	7,866	7,167	4,962
4	15,718	15,242	14,656	13,809	11,893
5	20,609	20,212	19,611	18,822	17,031
6	23,801	23,467	22,897	22,135	20,432
7	25,792	25,398	24,873	24,185	22,508
8	26,949	26,507	25,965	25,332	23,690

Source: Meyer, Everett and Van Amburgh, 2004

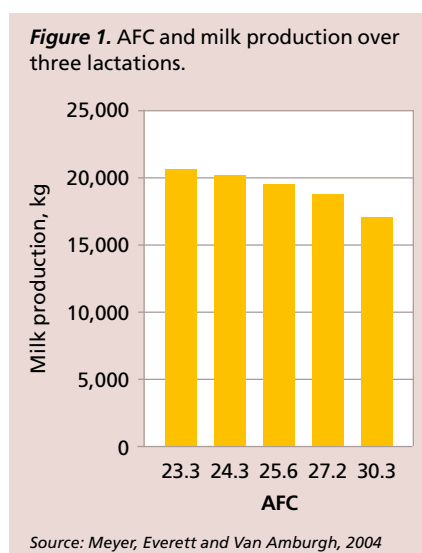
less stimulatory than other VFA.

Post-weaning, hay must be offered to prevent the papillae from forming layers of keratin that would reduce the absorption of VFA, and to develop the muscular layer of the rumen. Prior to weaning, hay does not encourage ruminal development. In fact, hay reduces solid feed (starter) intake and will often be turned into bedding, with obvious economic costs.

VFA are produced by the fermentation of milk, hay or concentrate. Concentrates are the most effective precursors of propionate and butyrate. Therefore, an early and high intake of concentrate is the most effective way to develop the rumen epithelium. Forage on the other hand will be primarily fermented to acetate, which is also lower in energy. Consequently the first concentrate should be highly palatable to promote higher starter intake from the very beginning.

Weaning growth slump

It is common to observe post-weaning growth slumps. This is mostly related to calves not being ready for weaning. To



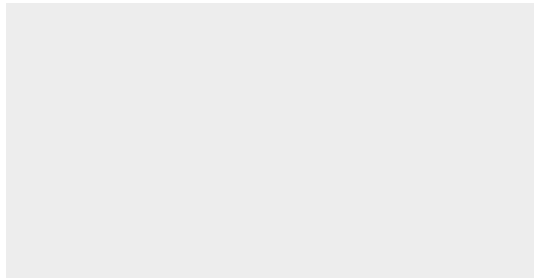
prevent this slump, calves should not be weaned until they are consistently consuming at least 1 kg of starter daily. The same starter fed before weaning should be fed after. It is a good practice to include a phytochemical (such as Digestaron® Calf) that will promote starter intake prior to and after weaning.

Did you know...

...that more than half of all calf mortalities are due to digestive problems?

Find out how to prevent such deaths, and let heifers truly be the future of your farm!





Digestarom[®]

Better digestion for
better feed efficiency

- Add the power of** • A unique blend of herbs, essential oils and functional flavors
Phytogenics to • Proven in science and practice
your diet: • Tailored to the animal's needs



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