

Unlocking the power of plants to promote calf rearing

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The plant kingdom offers an incredible diversity, and despite years of scientific study, secrets remain hidden in berries, flowers, leaves, peel, bark or roots. Even today, ongoing discovery of secrets regarding plants, spices and essential oils or extracts can reveal solutions to challenges in the everyday farm business.

The pathway to highly productive cows with good longevity starts with healthy calves and heifers. However, according to the 2007 USDA report almost 8% of heifer calves die before weaning; this represents not only direct economic losses but also losses of future economic benefits and genetic potential. The latter is even more severe assuming a progressive breeding plan since calves normally have a higher genetic value than adult cows.

Even when the calf survives the pre-weaning period, serious illnesses and health issues like diarrhoea and other digestive disorders can affect future lactation performance.

Therefore, the best strategy to produce healthy, high performing cows is to put an emphasis on calf management and heifer rearing and adopt an integrated management system including calving management, colostrum administration, nutrition and veterinary practices.

The power of plants

Because the use of antibiotics as a growth promoter or preventative treatment was banned in several countries years ago, alternative solutions for the support of animal health have to be found and applied.

Historically, the curing and health supportive effects of plants have been used for thousands of years and have been re-discovered in scientific circles over the past decades.

PhytoGenics are plant-derived substances that can serve as a natural growth promoter. In previous decades, the research

Name	Important constituents
Anise	Trans-anethole, methylchavicol, anise aldehyde
Caraway	Carvone, limonene
Cinnamon	Cinnamaldehyde, cinnamyl acetate
Clove	Eugenol, eugenyl acetate, β -caryophyllene
Fennel	Trans-anethole, limonene, terpinene
Oregano	Carvacrol, thymol, p-cymene
Peppermint	Menthol, isomenthone, limonene
Rosemary	1-8-cineol, α - and β -pinene, borneol
Thyme	Thymol, p-cymene, carvacrol

Table 1. Important constituents of selected essential oils (adapted from Jänicke et al. 2013 and Tisserand and Young 2014).

of phytoGenic additives focused mainly on their use and effectiveness. Hence, more and more questions are being answered in terms of their biological activities.

This knowledge is also crucial in newborn calves. In several regions across the world, the application of phytoGenics is already well established to improve feed intake and growth performance.

Stress factors

In calves, strong feed intake creates the basis for enhanced rumen development and growth performance. Early in life, calves not only have to adapt to the new environment, but also have to cope with several changes in their housing and nutrition.

After receiving colostrum for the first days of their lives, their daily milk intake changes usually to milk, waste milk, milk replacer or a mix of those. Further, calves are sensitive to the way milk is supplied to them, putting an emphasis on temperature, timing and hygienic quality. Later, roughage and concentrates are also administered to their diet. Weaning is another crucial stress factor, especially as it is usually accompanied by a change of housing.

These stress factors can lead to an increased incidence of diarrhoea and other gastrointestinal disorders. The bioactive compounds of plant-derived substances have been shown to have beneficial effects

in maintaining calves' feed intake, further supporting both digestion and feed utilisation.

Natural flavours

To have a positive effect on feed intake, palatability is the key. PhytoGenic compounds, such as herbs, spices, extracts or even single active compounds exert a range of flavouring properties.

Consideration of species-specific preferences in the formulation of a phytoGenic additive requires a deep understanding of flavouring properties of each plant-derived substance. There are several types of flavours which can be added to animal diets in order to improve sensory properties of the feed or mask unpleasant flavours.

Plants and their efficacies

Besides palatability, a proper understanding of plants and their bioactive efficacies of both volatile and non-volatile compounds is a prerequisite in the formulation of an effective phytoGenic feed additive capable of delivering a positive influence on gut performance.

The incredible biodiversity of the plant kingdom provides various active substances

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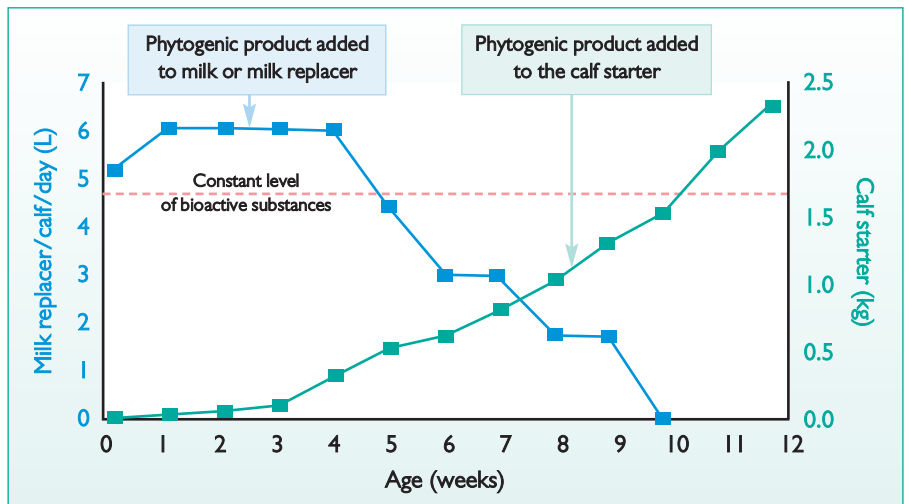


Fig. 1. Concept for application of phytoGENICS in calves.

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to support one or more effects in the organism. Examples of selected essential oils with some major constituents are shown in Table 1.

Spices, herbs, essential oils or extracts have different impacts depending on the chemical structure of the constituents or active compounds. Phenols such as thymol, carvacrol and eugenol (often derived from thyme, oregano and clove) and their methyl ethers have strong antiseptic properties. Carvacrol and thymol seem to demonstrate outstanding antimicrobial properties.

Strong antioxidative properties are associated to species of the families of Apiaceae (for example caraway and fennel) and Lamiaceae (for example rosemary and peppermint). Furthermore, plant extracts and oils such as clove and rosemary exert anti-inflammatory effects.

These matter because both antioxidative potential as well as anti-inflammatory effects are key parameters in gut protection.

Other plant compounds improve digestibility by supporting digestive secretions such as bile, mucus and saliva as well as enhancing enzyme activity.

In addition to the advantageous effects listed here, further beneficial impacts have also been attributed to phytoGENICS.

Gut performance

Gut performance and health have clear importance in growing calves given the benefits of good digestion, high feed efficiency, animal health and welfare.

Digestibility and gut protective effects are of particular importance in newborn calves and around dietary changes such as weaning. Effective phytoGENICS require precisely defined formulations, high quality standards and strict quality control which ensure the right amount of bioactive compounds to improve palatability, thus supporting calves during these critical stages.

During the first weeks of life calves' diets can be supported with flavourings in milk or

milk replacer when the rumen is still underdeveloped and calves rely on nutrients from milk. Later, when calves start ingesting starter feed or concentrates, respectively, feed intake and the balance in the gastrointestinal tract is recommended to be supported by supplying phytoGENIC additives in calf concentrates.

Offering feed with an additive, precisely meeting the gustatory and olfactory preferences of calves, raises the opportunity to support feed intake and further provides a steady amount of bioactive compounds to support the organism when milk supply is declining (Fig. 1).

This is a key to achieve fast rumen development and growth rates while increasing feed efficiency – hence the economic benefit.

A recent study including phytoGENIC additives in milk replacer and calf concentrates improved feed intake by 2.1%, increased animals' average daily weight gain by 8.1% and improved feed efficiency by 5.6% compared to the control group. Enhanced performance results along with decreased veterinary treatment costs resulted in an improved economic result.

Conclusion

In order to ensure a smooth change around weaning, a constant level of bioactive compounds is recommended in milk or milk replacer as well as in concentrate to support calves in the time when they have to increase their concentrate intake as milk supply is declining.

A phytoGENIC feed additive can help calves cope with challenges in their first weeks of life by influencing digestibility, gut microbiota modulation and antioxidative and anti-inflammatory processes. PhytoGENICS also offer the potential to support feed intake in calves by having a palatability enhancing effect which creates the basis for enhanced rumen development and growth performance – ultimately offering a potentially higher economic result. ■