

The use of plant extracts to support growth in early calfhood

Dairy herd annual turnover rates can be as high as 35%; thus, raising replacement heifers to maintain or expand the number of milking cows in a herd is crucial. Dairy producers start rearing their replacement heifers even before they are conceived by their dam by developing and implementing nutrition and breeding programs for the dams, careful selection of sires, design of facilities, and the use of new technologies, among others.

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It has been estimated that the cost of rearing each dairy heifer can range from €1,400-1,700. Therefore, it should not be surprising that replacement heifer raising programs are amongst the largest expenses in dairies, accounting for 15-20% of the total costs.

Parturition is a critical event for the dairy cow and the newborn calf. Proper management of the dam and the calf around calving is essential in order to minimise diseases, mortality and positively impact future performance. The bovine placentation type (epitheliochorial) does not allow in-utero transfer of immunoglobulins (IGs); consequently, calves rely on IGs present in

maternal colostrum for transfer of immunity.

Colostrum is not only important from an immunological perspective, but is also an excellent source of nutrients, growth factors and hormones. Thus, feeding adequate amounts of good quality colostrum in a timely manner is essential for the health, survival, growth and future performance of newborn calves. In addition to colostrum, excellent nutrition and sanitary programs, facilities and environment, are critical for optimal calf development.

After birth, calves are exposed to a variety of pathogens and environmental conditions that can predispose them to develop diseases, despite adequate transfer of immunity.

Digestive and respiratory disorders account for 56.5% and 22.5% of deaths in pre-weaned dairy heifers, respectively. Diarrhoea in neonatal calves is the leading cause of mortality in dairy herds globally.

Neonatal diarrhoea

It has been reported that almost 25% of pre-weaned heifers experience scours or other digestive issues and almost 75% receive antibiotic treatment. A study that surveyed calf ranches across the US reported that 22% of pre-weaned heifers experienced diarrhoea, with 62% and 36% receiving one or more than one

	Control	IQs
Calf milk replacer (kg/calf)	36.5	36.5
Concentrate (kg/calf)	35.8	38.7
Corn (kg/calf)	33.8	36.3

Table 1. Intake (kg/calf) of calf milk replacer, concentrate and corn in Holstein-Friesian male calves that were supplemented with IQs.

type of antibiotics, respectively. Thus, occurrence of health events early in life not only affects calves but can also be regarded as a public health concern due to the potential development of antimicrobial resistance.

Neonatal diarrhoea is a complex disease that affects calves in the first four weeks of life and involves an interaction between one or more pathogenic viruses, bacteria or parasites, the environment, and the immune status of the calf. Regardless of the pathophysiological mechanisms by which these pathogens cause scours, common clinical signs include: dehydration, depression, reduced milk and feed intake, and weight loss. Season of birth, occurrence of diarrhoea, respiratory disease and septicaemia were associated with decreased growth rates (height and weight) of dairy calves during the first six months of life.

Additionally, it was reported that days of illness and days treated before four months of age had

significant effects on first lactation productivity. Soberon et al. (2012) reported that pre-weaning average daily gain (ADG) was positively correlated with first lactation milk yield, and observed that every extra kg of weight at weaning resulted in 850-1,113kg more milk in the first lactation.

Anything that lowers nutrient intake, and consequently growth rates in pre-weaned dairy heifers will negatively impact their future performance. During the pre-weaning period calves experience significant developmental changes that are directly linked to their adult performance.

The first 8-10 weeks of life are critical for female calves because the imprinting mammary gland capacity for milk production will occur during this period. Thus, being able to guarantee an adequate plane of nutrition, growth rates and health status is critical for the calves.

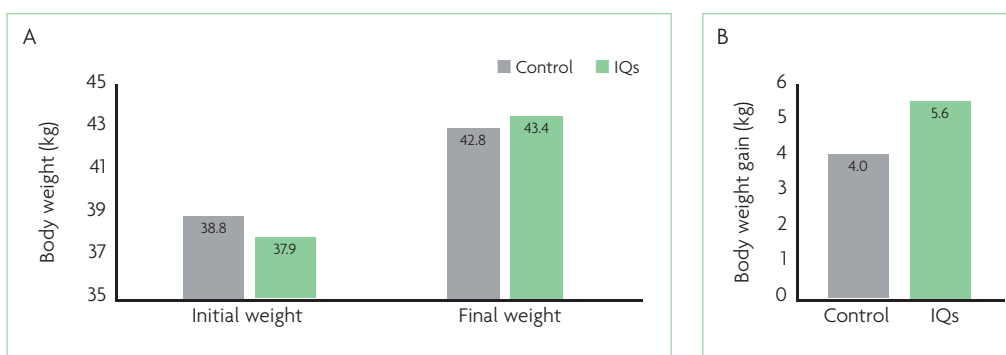
This can not only have a positive impact on future milk production but might also reduce the age at first calving, which is an economically relevant variable in dairy heifer rearing programmes.

Plant extracts have been gaining increasing attention in the feed industry due to their beneficial effects on palatability, feed intake and performance. Isoquinoline alkaloids (IQs) are secondary compounds from specific natural plants. These plant metabolites have been investigated as an effective nutritional strategy to improve feed intake and enhance performance in food producing animals (for example average daily gain, feed conversion, carcase yield).

Saltijeral et al. (2015) evaluated the effects of IQs supplementation to

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Fig. 1. Initial and final body weight (A; kg), and weight gain (B; kg) from birth until 23 days of life in Holstein Friesian calves supplemented with isoquinoline alkaloids (IQs; n = 80) and calves that received no IQs supplementation (control; n = 80).



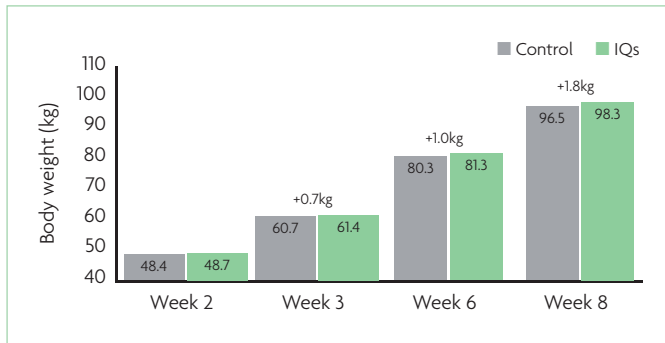


Fig. 2. Effects of isoquinoline alkaloid supplementation (IQs; n = 46) in the calf milk replacer for 21 days (control; n = 13) or no supplementation on Holstein-Friesian male calves' body weight.

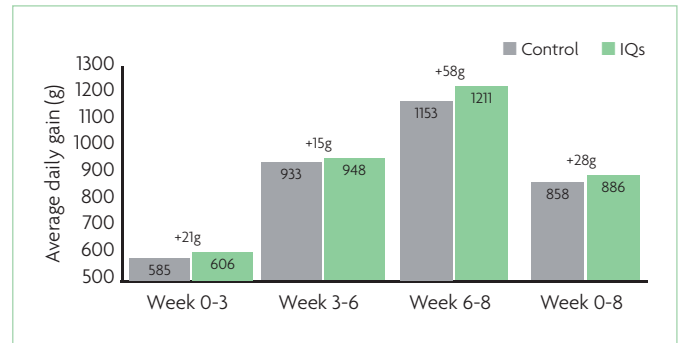


Fig. 3. Effects of isoquinoline alkaloid supplementation (IQs; n = 46) in the calf milk replacer for 21 days (control; n = 13) or no supplementation on Holstein-Friesian male calves' average daily gain.

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support growth and performance of dairy calves early in life. A total of 160 Holstein Friesian calves were randomly allocated to receive IQs (2g/animal/day; n = 80) in the milk replacer from day three to day 23 of life or remain as controls (no supplementation; n = 80).

Results showed that by day 23 of life calves supplemented with IQs weighed 1.5kg more when compared to control calves (Fig. 1).

More recently, 96 two-week-old Holstein-Friesian bull calves were enrolled in a trial designed to evaluate performance following supplementation with IQs.

Based on body weight, calves were randomly assigned to receive IQs supplementation in the milk replacer for 21 days (2g/animal/day; n = 48) or remain as controls (n = 48).

Results from this study showed that calves supplemented with IQs had higher average daily weight gains throughout the study period and thus body weight by week 10 of life was also higher (Figs. 2 and 3).

Furthermore, improved solid feed intake (extra 5.8kg) was observed in animals receiving IQs in the milk replacer (Table 1).

Research has shown that feeding higher amounts of milk improves growth rates and feed efficiency in

dairy calves. However, by feeding more milk there is a reduction in solid feed intake which is critical for rumen development.

Thus, findings from this study are encouraging because with the same level of calf milk replacer intake calves supplemented with IQs had increased solid feed intake which can have advantageous effects on rumen development and consequently post-weaning growth and performance.

In conclusion, due to the link between early life development and adult performance, being able to provide good colostrum management, nutritional

programmes, and environment is paramount for dairy calves. Anything that negatively affects nutrient intake, and consequently growth rates in pre-weaned dairy heifers, can negatively impact their future performance. Thus, strategies that contribute to improve growth and performance of young animals are critical. In this sense, IQs can be regarded as an effective strategy that positively impacts feed intake and supports growth parameters and rumen development. ■

References are available from the author on request