Ensuring a successful transition period for your dairy cows

The peripartum period represents a key moment in the life of the dairy cow. It can be defined as the period from three weeks before to three weeks after calving. Approximately 30-40% of the genetic potential of milk production occurs during this period.

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Poor transition often leads to a huge economic loss for dairy farmers due to compromised production and reproduction. 75% of health problems appear during the peri-partum period. Understanding the causes and consequences of metabolic changes during the transition period is therefore very important for postpartum health management and to implement nutritional strategies.

Rumen function

Nutritional requirements at the time of drying off are much weaker than those during lactation. Also, energy density of the ration is considerably reduced during the dry period to prevent rapid and excessive fattening of the milk cow; the drying ration is essentially based on fodder and the ruminal microflora is of cellulolytic type. This decrease in the energy density of the ration is accompanied by a reduction in the absorption area of ruminal papillae, which can be up to 50%. However, it takes 3-4 weeks to modify the fermentation profile of the rumen microflora, due to slow development of bacteria using lactate and at least five weeks to regain a full development of ruminal papillae.

A diet modification too abrupt to quickly cover the rise in nutritional requirements can therefore lead to the accumulation of volatile fatty acids or lactate in the rumen and cause ruminal acidosis with severe consequences on appetite and digestive function.

Energy metabolism

Four days after calving, energy and metabolisable protein requirements are about 25% higher than supplied by the diet.

The dairy cow is then obliged to mobilise body reserves to deal with this brutal increase in demand. The cow can mobilise 30-60kg of adipose tissue at the beginning of lactation. This mobilisation is accompanied by a rise in blood concentration of non-esterified fatty acids (NEFA), which is inversely proportional to the intake capacity.

High NEFA blood concentration increases the incidence of placenta retention, ketosis and left abomasum displacement. In fact, there is a sudden drop in dry matter intake before calving, which leads to a lot of postpartum disorders.

The accumulation of fat in the liver provokes an alteration of its functions, in particular gluconeo-genesis; for this one, the alteration is not direct, steatosis disrupts hepatic ureogenesis and elevation of ammonia secondarily impairs gluconeogenesis.

Table 1. Main troubles linked to the peripartum period and calving ([1]Guard, 2008[1], Overton, 2009[2], Stone, 1999[3], Bobe et al. 2004[4]).

	Incidence (%) per lactation	Cost of the disorders (U$/case)
Milk fever	4	275[1]
Ketosis	14	232[1]
Displaced abomasum	4	494[1]
Retained placenta	15	315[1]
Metritis	9	300[2]
Subacute ruminal acidosis	100	360[3]
Steatosis	4.6	145[4]

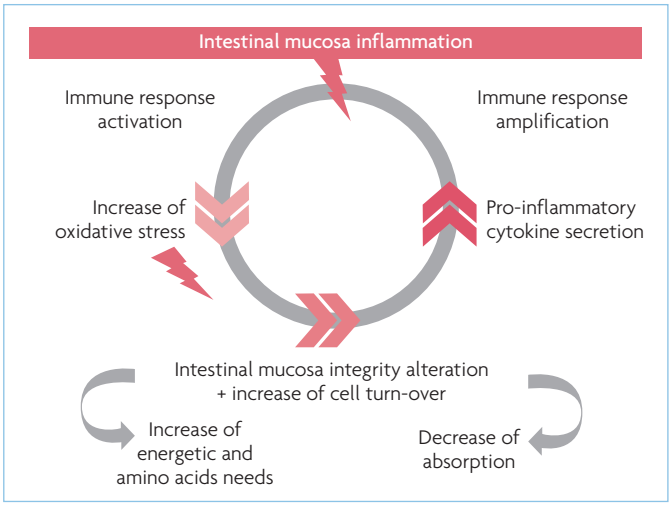

Fig. 1. Reaction to intestinal mucosa inflammation.

Calcium and bone metabolism

Another major cause of metabolic disease is a disruption of mineral balance, primarily calcium balance, around calving.

Lactogenesis and colostrum synthesis induce a large demand on calcium homeostasis mechanisms so that almost all cows develop some degree of hypocalcaemia at parturition. When plasma calcium concentration drops too low to support nerve and muscle function, parturient paresis, or milk fever, develops. Milk fever affects up to 4% of dairy cows around calving.

Traditionally, limiting calcium intake during the dry period is used to prevent milk fever. The goal of this strategy is to keep dietary calcium low enough so that calcium mobilisation mechanisms move calcium from body stores and make it available at calving when calcium demand for milk synthesis suddenly increases.

Dietary calcium intake should be limited to less than 50g/day before calving; however, diets containing such a low calcium concentration are often difficult to formulate because many forages commonly used in dairy diets, especially legumes, contain a substantial amount of calcium. Another concept in milk fever prevention is utilisation of dietary cation-anion difference (DCAD).

The goal in utilising DCAD in the diet formulation and anion supplementation is to reduce blood pH enough to effect calcium mobilisation in response to hypocalcaemia. An appropriate DCAD can be achieved by reducing the cation or increasing the anion supply in the diet.

Immune function

As discussed, peripartum represents a transition period favourable to metabolic disorders where cows are subject to oxidative stress related to the energy deficit and a high milk production. Free radicals appear as a normal end product of cellular metabolism.

Oxidative stress is strongly linked to the health status of cows; it decreases the immune response and increases the inflammatory processes. Studies have shown many changes in gene expression affecting the inflammation and immunity of

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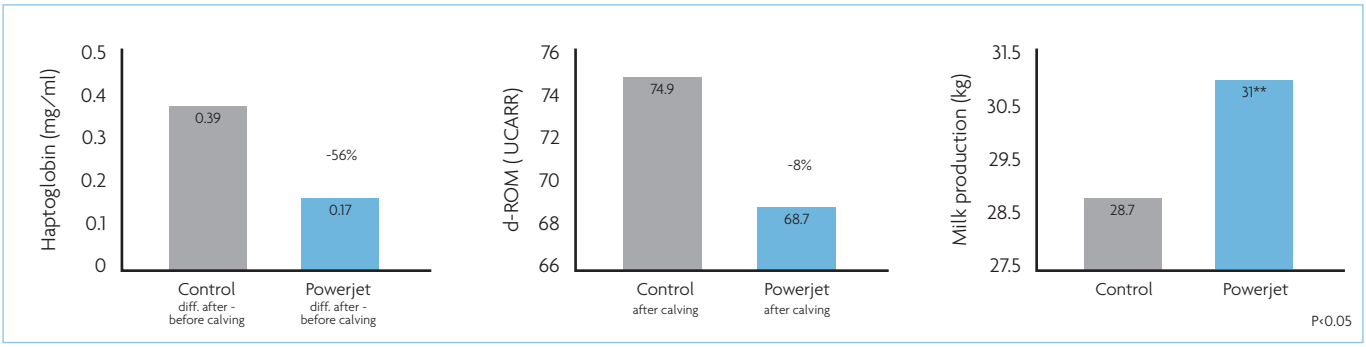

Fig. 2. Effect of Powerjet on intestinal mucosa inflammation, oxidative stress and milk production

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adipose tissue and mammary glands during the transition period.

Nutritional solution

The key to establish successful lactations lies in overcoming four main challenges:

- Rumen adaptation.
- Reduced dry matter intake.
- Higher demands for calcium.
- Impact of lipid mobilisation on liver function.

An integrated approach to manage transition cows is needed to deal effectively with these challenges.

That is why Wisium launched Transi Up, a specific nutritional program for peripartum cows, to improve health status and optimise milk potential (Fig. 3).

Premix, nucleus and specialities are designed with specific ingredients to meet the high requirements of the dairy cows in this period.

It includes an alternative solution as Powerjet – a patented combination of three active molecules issuing from two plants, coming from the human pharmacopeia (Chinese and Japanese medicine), recognised for their abilities to modulate intestinal mucosa inflammation and the associated oxidative stress.

The causes of intestinal mucosa inflammation are now demonstrated:

- Physiologic and metabolic changes.
- Environmental changes (hot climate).
- Intensive management.

Inflammation has a double impact: energy and amino acid needs increase, while there is a decrease in absorption at the level of the intestinal mucosa.

The increased maintenance need is estimated from 10-30% representing a loss of 1.8-2.5kg of milk.

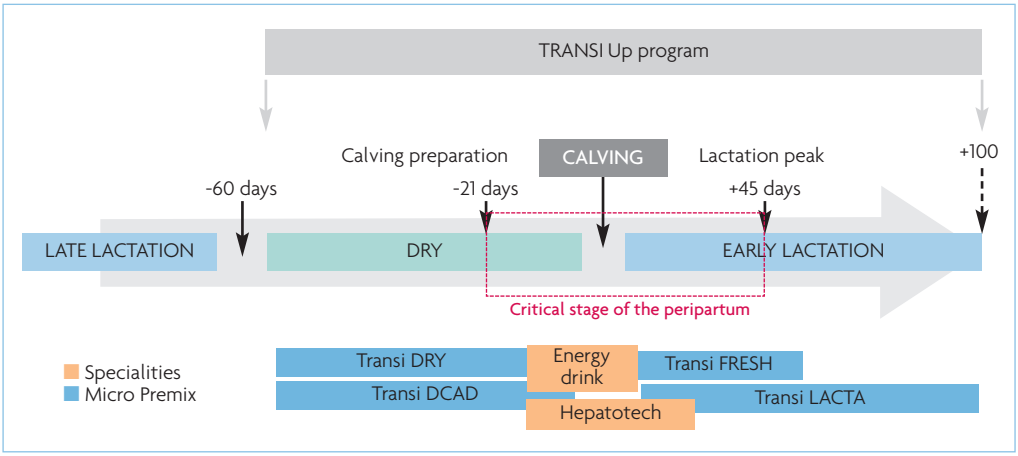
Powerjet activates molecules moderating the immune response and has an antioxidant action, which allows more energy and amino acids to be available for production.

In a study on a commercial farm in France, blood analysis was taken in 25 dairy cows before and after calving. Haptoglobin concentration was measured to evaluate the inflammation and d-ROM has an oxidative stress marker (Fig. 2).

Results indicate a moderation of the inflammation for the cows that received Powerjet, combined with a reduction in oxidative stress.

The improved immune response allows to spare nutrients and thus increase the milk production by 2.3kg of milk per cow per day.

Fig. 3. The Transi Up program.



Conclusion

Feeding strategies to prevent nutritional and metabolic disturbances in peripartum are now well known. However, due to the many changes occurring in this period (physiologic, metabolic, environmental), the immunological status of the cows are affected. Using specific ingredients has shown positive effects in reducing the effect of inflammation and oxidative stress. An improved immune system and higher milk production justified the use of supplementation. ■

References are available from the author on request