TechNote 11

Understand the transition cow

IN THIS TECHNOTE

During the transition period the cow moves from late pregnancy into lactation, and during this period she will typically move from the dry herd into the springer mob, to the colostrum mob, and then into the main milking herd. A successful transition during this period is vital to:

- prevent the onset of metabolic and infectious diseases,
- optimise seasonal performance: body condition score (BCS), reproduction, health and production,
- prevent premature culling.

For this resource, the transition period covers 2 – 3 weeks pre-calving until the end of the colostrum period. The subsequent period, when the cows enter the milking herd, will be covered in the Early lactation section (Technotes 15-19).

11.1 Understand physiological changes that occur during transition

Substantial physiological changes occur as the cow transitions from pregnancy to lactation (Table 1). With the onset of lactation, there is a sudden and large increase in nutrient requirements which is not matched by a concomitant increase in nutrient intake, and, thus, the cow enters into a stage of negative energy balance immediately post-calving.

The magnitude of the negative energy balance is simply the difference between energy input:
dry matter intake (DMI) x feed quality, and energy output: milk production + cow maintenance + activity (Figure 1).
The size of the energy deficit immediately post-calving, in a moderate-yielding cow grazing good quality pasture is similar to that of a high-yielding cow fed a total mixed ration.

Table 1. Physiological changes during the transition from pregnancy to lactation.

Process or metabolism	Tissue	Change	Process
Milk production	Mammary gland	↑	Number and activity of secretory cells Blood flow Nutrient uptake and use
Fat metabolism	Adipose tissue	↑	Body fat mobilisation ß-oxidation and ketogenesis
		↓	*Denovo* fatty acid synthesis Uptake of fatty acids and esterification
Protein metabolism	Muscles	↑	Proteolysis
		↓	Protein synthesis
	Other tissues	↑	Protein synthesis
Glucose metabolism	Liver	↑	Size of the liver Blood flow to the liver Gluconeogenesis
	Other tissues	↓	Use of glucose for energy
Mineral metabolism	Gut	↑	Mineral absorption
	Bones	↑	Calcium mobilisation
Feed intake	Whole system	↑	Dry matter intake
Digestion	Digestive tract	↑	Size of digestive tract Absorption rate and capacity Metabolic activity
Blood flow	Heart	↑	Output from heart Proportion of blood partitioned to mammary gland, gastrointestinal tract and liver

For more details see TechNotes 5: Carbohydrate metabolism, 6: Protein metabolism, 7: Lipid metabolism, and 8: Fibre metabolism.

To adapt to the negative energy balance immediately post-calving, and provide the necessary energy for milk production, the cow mobilises large amounts of body tissue (primarily fat, with smaller amounts of protein), which is reflected in a loss of BCS.

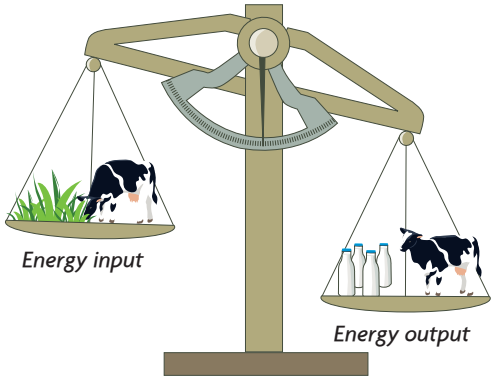
Little can be done in the first few weeks post-calving to alter this BCS loss. The primary regulators of the performance of the transition and early lactating dairy cow are BCS at calving, and nutrition management pre-calving.

For more details see TechNote 12: Feed the transition cow appropriately.

Q: Can I prevent BCS loss immediately post-calving?

A: No, there is little that can be done in the first few weeks post-calving to alter BCS loss. The primary regulators of BCS loss post-calving are BCS at calving and nutrition management pre-calving.

Figure 1. *Energy balance in the transition dairy cow.*



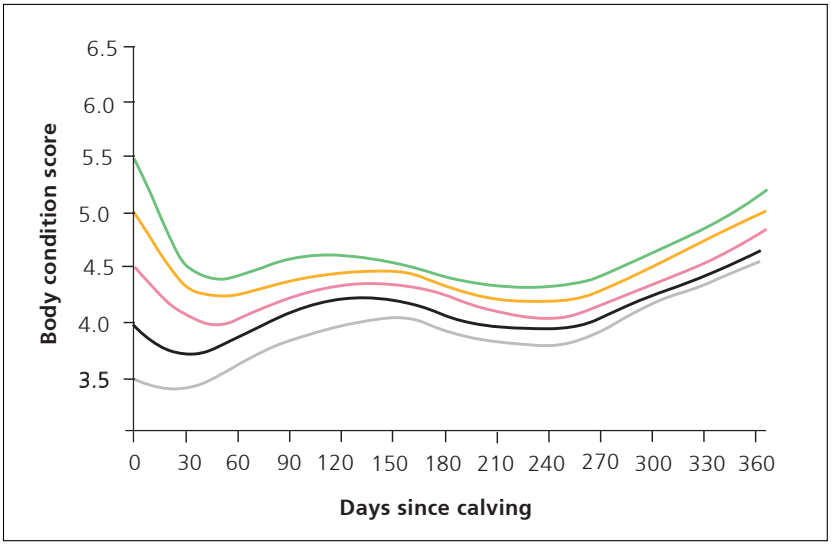
11.2 Know the importance of body condition score at calving

Body condition score targets at calving are set to optimise milk production and maximise reproduction and health. Mixed-aged cows should calve at a 5.0 BCS, while 2 and 3 year olds should calve at a 5.5 BCS.

Cows thinner than target BCS have poorer immune function and are at a greater risk of infectious diseases (e.g. mastitis and metritis). They also produce less milksolids and have poorer reproductive performance in the following season.

However, if fatter than target BCS, cows will have a lower DMI and greater BCS loss post-calving (Figure 3), predisposing them to metabolic disorders such as ketosis, fatty liver and milk fever, especially if they are consuming more than their metabolic requirements in the 2 – 3 weeks pre-calving.

Figure 3. *Schematic of BCS profiles with different BCS at calving (DairyNZ InCalf resource).*



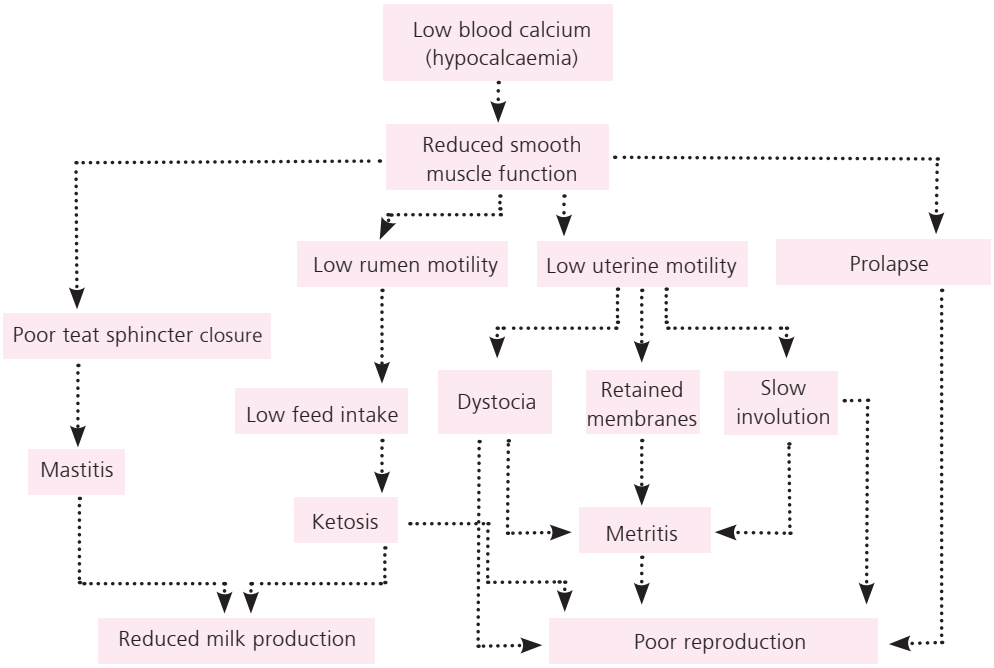
For more details see TechNotes 12: Feed the transition cow appropriately, 13: Monitor and mitigate milk fever, 14: Monitor and mitigate ketosis, and 15: Monitor and mitigate fatty liver.

11.3 Be aware of common metabolic disorders

Metabolic disorders occur when the dairy cow cannot successfully adapt to all the physiological changes. The most common metabolic disorders that occur during the transition period in pasture-based systems are milk fever and ketosis, with incidence of fatty liver and left displaced abomasum increasing in systems feeding high levels of supplement.

Metabolic diseases are complex and interrelated (Figure 2). The occurrence of one can increase the risk of another and also predispose the cow to infectious diseases.

Figure 2. *The relationships between metabolic disorders (Roche, 2012).*



Prevention is preferable to treatment and this can be achieved through careful planning and management of cows during the transition period with an emphasis on: BCS, DMI, mineral supplementation and feed choice, particularly pre-calving.

For more details see TechNotes 12: Feed the transition cow appropriately, 13: Monitor and mitigate milk fever, 14: Monitor and mitigate ketosis, 15: Monitor and mitigate fatty liver, 16: Determine energy requirements, and 30: Achieve BCS at calving.

11.4 Further reading

Bauman, D. E. 2000. Regulation of nutrient partitioning during lactation: Homeostasis and homeorhesis revisited. Pages 311 - 327 in Ruminant Physiology: Digestion, Metabolism, Growth and Reproduction. P. J. Cronje, ed. CAB Publishing, NY.

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Kolver, E. S., J. R. Roche, M. J. de Veth, P. L Thorne, and A. R. Napper. 2002. Total mixed rations versus pasture diets: Evidence for a genotype x diet interaction in dairy cow performance. Proceedings of the NZ Society of Animal Production. 62: 246 – 251.

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The InCalf Book for NZ Dairy Farmers. Section 9: Body condition score and nutrition. dairynz.co.nz/media/748061/incalf-book-WEB-may-2010-b.pdf