



Transition cow management for dairy farmers

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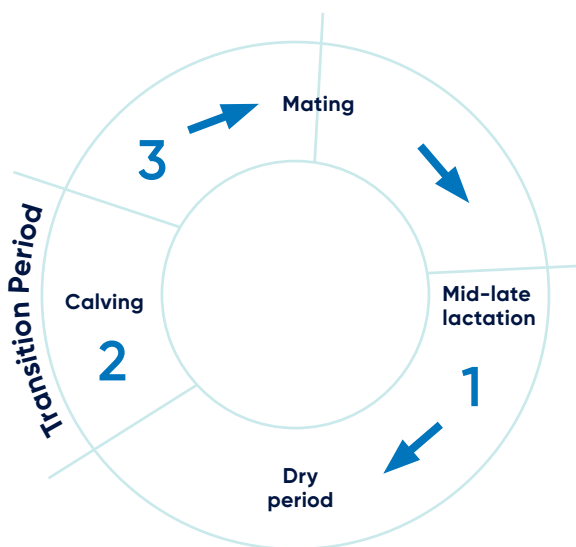
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Introduction

Minimising the decline in feed intake as calving approaches and limiting the risk of metabolic disorders, particularly milk fever, are two of the key objectives of feeding during the last few weeks of gestation.

Calving time – stressful for cows

- Nutrients are required to support growth and maintenance of the foetus, placenta, uterus and mammary gland.
- Feed intake at calving and intake in early lactation are linked. Cows that eat well in early lactation go on to be more productive later in the lactation.
- The pre-calving transition diet should introduce feeds the cow will encounter post-calving.
- Low feed intake results in body condition loss, which if excessive may lead to metabolic disorders such as ketosis and fatty liver.
- Although cows have plenty of calcium stored in their bones, they need at least one week to begin the mobilisation process. If the cow's calcium demand at calving exceeds supply, her blood calcium level will fall, resulting in milk fever.



The transition period is therefore a period of the cow's lactation cycle when the cow is at great risk of health problems which impact on herd productivity and animal welfare:

- **Around 80 per cent of cow health problems occur within four weeks of calving** – including milk fever, grass tetany, ketosis, retained placenta, metritis, ruminal acidosis, displaced abomasum, mastitis and lameness
- **Around 80 per cent of disease costs in adult cattle occur in the first four weeks after calving** – it is a peak period for involuntary culls and deaths.
- The most life-threatening presentation of failure to adapt to the challenges of calving and lactation is the downer cow. (i.e. a late pregnant or recently calved cow that is lying down on her chest or side and unable to rise). A downer cow is a veterinary emergency. To protect her welfare:
- Immediately determine the cause of her being down (seek urgent veterinary advice if unsure) and commence treatment and appropriate nursing care.
- If possible, get the cow back on her feet quickly to avoid secondary nerve damage and other complications.
- If her chances of recovery are low, she must not be left to suffer. Arrange for her to be humanely destroyed on site as soon as possible.

For further information on managing downer cows,
[dairyaustralia.com.au/animals/health-and-welfare/
down-cows](http://dairyaustralia.com.au/animals/health-and-welfare/down-cows)

Successfully managing the transition period is a win for your cows, your people and your farm business!

Calving time – stressful for people too!

Calving time is also stressful for herd managers and staff – particularly on farms using seasonal and split calving systems.

As there are so many tasks to attend to at this time, it is important that management and decision making is active to stay on the 'front foot'.

Research and experience over the last twenty five years about how to manage the transition period has led many Australian dairy farmers to implement very successful transition feeding programs pre-calving which make calving relatively hassle-free.

Benefits gained include:

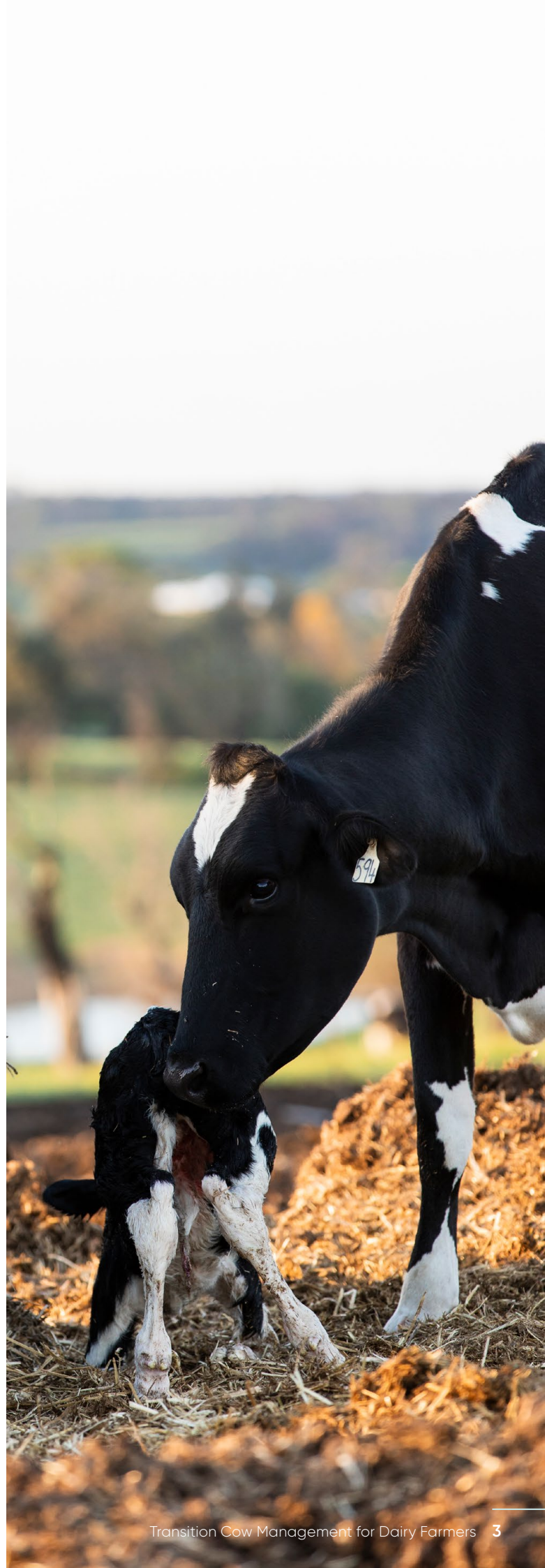
- Dramatic reductions in milk fever and other cow health problems around calving
- Increased milk production
- Improved fertility

This introductory booklet has been designed as a resource for dairy farmers who attend a Low Stress Calving discussion session. It is intended to be a simple, practical set of guidelines and supporting information to assist farmers in successfully implementing a transition cow management program which suits their goals and feeding system. (There are of course several other aspects to calving management that are not covered in this booklet).

The booklet complements a number of other Dairy Australia resources and tools aimed at helping farmers set their cows up for low stress calving and healthy, productive, fertile lactations.

These resources and tools can be found on the Dairy Australia website: dairyaustralia.com.au/animals/health-and-welfare/down-cows

Calving time is very stressful for the dairy cow's body. From four weeks before calving to four weeks after calving (called the transition period), the cow undergoes a series of dramatic metabolic changes that allow her body to adapt to the challenges of calving, lactation and re-breeding.



Section 1 Benefits of improved nutrition in the last three weeks before calving

What's possible with effective transition nutrition?

Effective pre-calving transition nutrition has five key aims:

- 1 Meet the cow's increasing demand for energy and protein.
- 2 Maintain dry matter intake.
- 3 Adapt the cow's rumen to the post-calving diet.
- 4 Minimise the risk of milk fever and other cow health problems.
- 5 Minimise body condition loss and the risk of ketosis and fatty liver.

If these five key aims are achieved the benefits are considerable and include:

- The cow is set up for a productive lactation.
- Almost no clinical cases of milk fever in the herd.
- Very low incidence of other health problems soon after calving.
- Reduced death and culling rates around calving.
- Improved herd reproductive performance.
- Less time and stress spent treating sick and downer cows.
- Improved animal welfare.

Transition feeding has evolved from a focus on milk fever control to an integrated nutritional approach.

Depending on the approach used, a transition feeding program could cost between \$20 and \$60 per cow, but return a net benefit of up to \$200 or more per cow (after additional labour and feed costs are accounted for).

Reducing the levels of cow health problems in your herd

The table below shows the levels of particular cow health problems which are achievable on Australian dairy farms through the use of well implemented, integrated pre-calving transition diets, and the levels which are unacceptable in terms of herd productivity and animal welfare and require action.

Health problems	Achievable levels	Not acceptable. Seek help
Milk fever	1%	> 3%
Clinical ketosis	< 1%	> 2%
Abnomasal displacements (left or right)	< 1%	> 2%
Clinical mastitis	< 5 cases/ 100 cows/ first 30 days	< 5 cases/ 100 cows/ first 30 days
Lameness (Sprecher locomotion scale 1-5)	< 2% > Score 2	> 4% > Score 2
Hypomagnesaemia (Grass Tetany)	0%	1 case
Retained placenta > 24 hrs after calving	< 4%	> 6%
Vaginal discharge after 14 days	< 3%	> 10%
Calvings requiring assistance	< 2%	> 3%
Clinical acidosis	0%	1%

Timing is important! Aim to feed a transition diet for a full three weeks before calving.

How long should cows spend on the transition diet for greatest benefits?

Milk production responses of 300–500 litres per lactation have been reported in research trials in which cows were fed well balanced transition diets pre-calving.

Recent Australian research in commercial herds indicates that the production benefit obtained is greatest when a well-balanced transition diet is fed for just over 3 weeks pre-calving. (See Figures 5 to 7 on page 25).

Research suggests that reproductive performance improves when a well-balanced pre-calving transition diet is fed: up to 5 per cent higher 6-week/100-day in-calf rate and 5 per cent lower not-in-calf rate.

The longer cows spend on the transition diets pre-calving, the greater the reproductive benefit and the lower the risk of cows dying or being culled. (See Figures 8 and 9 on page 25).

However, because transition feeding cows for more than 24 days has potential negative effects on the risk of milk fever and does not give any additional production benefit, 3 weeks is recommended.

Not only is effective transition nutrition good for your cows and your bottom line, it also reduces calving hassles for the people on the farm.

Here's what farmers have said:

"I'm not chasing my tail any more treating crook cows"

"Calving runs so much smoother now than it used to!"

How much do you have to gain on your farm?

How much you have to gain from improved transition nutrition on your farm depends on:

- Which approach to transition feeding you are willing and able to use.
- Your current levels of milk fever and other cow health problems.
- Your current herd production and reproductive performance.
- How well you set up and implement your transition feeding program so as to gain the full potential benefit it offers.

However, one thing is clear: The more that is done to help the cow successfully deal with the challenges of calving, lactation and re-breeding, the greater the benefit.

Are there any negative effects of improved transition cow nutrition?

There is some evidence that improving transition cow nutrition may increase the risk of mastitis. It has also been suggested that transition cow nutrition may slightly reduce colostrum quality and calving ease. However, these concerns are far outweighed by the benefits of an integrated approach to transition cow nutrition.

Potential problem	Comment	Actions to manage risk
Increased risk of mastitis	An increased risk of mastitis may be associated with any strategy which increases milk production. Cows that develop marked ventral udder oedema (flag) or leak milk have completed their transition and calves born need to receive colostrum from another cow or stored colostrum. Transition diets with high levels of sodium and potassium may predispose to udder oedema.	Use teat sealant (with or without dry cow therapy) at drying-off, as recommended by your vet; Apply teat disinfectant each time cows pass through the milking shed if feeding a transition supplement in the bail; Milk any cows that develop marked ventral udder oedema (flag) or leak milk prior to calving; and Calve cows in a clean, dry environment. Refer to Countdown Farm Guidelines dairyaustralia.com.au/resource-repository/2023/08/30/countdown-resources
Reduced colostrum quality	Cows fed well-formulated transition diets may produce more first milking colostrum, with a slight dilution of antibody concentration.	Use industry-recommended colostrum management practices. (Refer to chapter 4 of the Dairy Australia 'Rearing Healthy Calves' book. dairyaustralia.com.au/animals/calf-rearing/managing-calf-health
Higher calf birth weight and increased calving difficulties	Most studies have not shown any effect of pre-calving nutrition on calf birth weight and level of calving difficulties. Genetics exert the biggest influence on calf birth weight. Cows fed well-formulated transition diets are more likely to have normal blood calcium levels at calving, and therefore produce strong uterine contractions for quicker, easier calvings.	Use bulls which have high calving ease ABVs.

Section 2 Putting transition cow management into practice

Approaches to transition feeding

There are a number of common approaches to pre-calving transition feeding. Each approach varies in the extent to which it helps the cow deal with the challenges of calving, lactation and re-breeding.

The transition feeding approach that best suits your farm depends on:

- your intended grain/concentrate feeding rate during early lactation.
- your feeding infrastructure and equipment.
- the levels of milk fever and other cow health problems you can cope with.
- the broader health, production and fertility benefits you are seeking.
- the level of risk to cow health, productivity and farm profitability that you are prepared to accept from sub-optimal transition nutrition.

Approach	Pasture/hay only	Pasture/hay and anionic salts in fodder or water	Pasture/hay and grain/concentrate	Pasture/hay and grain/concentrate and DIY anionic salts	Pasture/hay and commercial transition supplement (lead feed)*	Fully intergrated transition diet fed as PMR or TMR
Effective in terms of:						
Rumen adaptation	-	-	✓✓✓✓	✓✓✓✓ - ✓✓✓✓	✓✓✓✓✓	✓✓✓✓✓
Positive Metab. Energy balance	-	-	✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓✓
Positive Metab. Protein balance assets	-	-	✓	✓✓	✓✓✓ - ✓✓ ✓✓	✓✓✓✓✓
Milk fever control	-	✓ - ✓✓	-	✓✓✓	✓✓✓✓✓	✓✓✓✓✓
Other metabolic disease control liabilities	-	-	✓✓	✓✓✓✓	✓✓✓✓✓	✓✓✓✓✓
Improved animal health	-	✓✓	✓✓	✓✓✓	✓✓✓ - ✓✓ ✓✓	✓✓✓✓✓
Improved milk production	-	✓	✓✓	✓✓✓	✓✓✓ - ✓✓ ✓✓	✓✓✓✓✓
Improved fertility	-	✓	✓✓	✓✓	✓✓✓ - ✓✓ ✓✓	✓✓✓✓✓
Overall effectiveness	-	✓✓	✓✓	✓✓ - ✓✓✓✓	✓✓✓ - ✓✓ ✓✓	✓✓✓✓✓
Comments	Does not address any needs of the transition cow	Does not address rumen adaptation to grain/conc	Does not address control of macromineral disorders	Possible palatability problems. Can be difficult to control macro mineral disorders	Can be a highly effective strategy if diet is fully intergrated	Highly effective strategy

* May or not include all the nutritional components to provide a fully intergrated transition diet
Source: Lean & DeGaris, 2010



A lead feed is often used as part of a pre-calving transition diet. A lead feed is a grain-based supplement which may contain protein supplements, magnesium, anionic salts or an anionic feed product, micro-minerals, rumen modifiers and other additives.

Should springing heifers be included in the transition feeding program?

Yes! While heifers are unlikely to suffer clinical milk fever when they calve, including them in the transition feeding program will help their rumens adapt, provide them with extra minerals and help them socialise with older animals

If you choose to lead feed in the milking shed, this also allows heifers to become familiar with the holding yard and the shed, and with concrete surfaces.

One of the greatest advances in transition feeding in Australia in recent years has been the inclusion of heifers.

80 per cent of Australian farmers who use a transition feeding program now include their heifers.

Transition feeding does not require you to change your feeding system or milker grain/concentrate feeding rate.

Transition feeding options suitable for different feeding systems:

For farmers using a Low Bail feeding system

Using just pasture/hay is not recommended.

- When pasture dominates it exposes cows to a high risk of milk fever or grass tetany (hypomagnesaemia).
- When hay dominates it exposes cows to a high risk of low production and pregnancy toxaemia.

Farmers who feed less than 3kgs of grain/grain-based concentrate per cow per day to their freshly calved milking cows should consider:

- Supplementing transition cows pre-calving with magnesium and anionic salts in fodder or drinking water to help control milk fever and other health disorders related to macrominerals.

If you choose to provide anionic salts in drinking water, note:

- Daily water consumption varies widely between cows and in different weather conditions.
- Adding anionic salts to fodder or drinking water may reduce daily cow feed or water intakes. So monitor closely.
- Top up water troughs twice a day instead of once.
- Consider using a water proportioner device to maintain a stable concentration of anionic salts.
- Use of a molasses-based commercial anionic supplement, fed in troughs or lick drums, is also a good way of delivering magnesium and anionic salts, while also providing additional energy.
- Also providing transition cows with some grain/grain-based concentrate pre-calving may assist in ensuring cows' daily energy and protein demands are met.

Feeding the transition diet as a total mixed ration provides maximum control over cows' daily feed intakes of all diet components.



Any improvement in transition feeding management will reap benefits.

Be patient. It may take 2–3 years for you to work out how to make your new transition feeding program best fit with your staff, facilities and daily routines.

For farmers using a Moderate-High Bail feeding system

Farmers who feed more than 3kgs of grain/grain-based concentrate per cow per day to their freshly calved milking cows should consider providing their transition cows with some grain/grain-based concentrate pre-calving to help adapt their rumens.

Feeding a professionally formulated transition supplement ("lead feed") in combination with suitable pasture/hay is the most desirable approach.

- The lead feed may be fed either in the milking shed or in the springer paddock.
- In addition to grain, lead feed products may contain protein supplements, magnesium, anionic salts or an anionic feed product, micro-minerals, rumen modifiers and other additives. Refer to product bag tag and brochure for details.

Adding DIY anionic salts to grain is not recommended.

For farmers using a Mixed Ration feeding system

Farmers who use a partial mixed ration (PMR) or Hybrid feeding system may also feed a lead feed to their transition cows pre-calving in the dairy shed or in the springer paddock, in combination with pasture / hay.

They also have the option of using their mixer wagon and feed pad to prepare and feed a fully integrated transition cow PMR incorporating grain, protein supplements, magnesium, anionic salts, and other components with suitable forages +/- some grazed pasture.

Farmers using a zero grazing total mixed ration (TMR) are most likely to feed a fully integrated transition cow total mixed ration.

Feeding a transition feed supplement ("lead feeding") in the milking shed versus the springer paddock

Either method has its challenges but can be very effective if well managed. Each farmer will have their own preference.

Things to consider:

If lead feeding in milking shed

How will intakes of individual cows be controlled?

- Using a rotary? Consider installing an extra feed head and silo dedicated to the transition supplement.
- Using a herringbone? Check the feed system is well calibrated and delivering consistent amounts per bail. Consider installing an extra feeding system.

Manage springing heifers by:

- pregnancy testing them too to get accurate due calving dates.
- putting them in with the springing cows or running as a separate group.



If lead feeding in springer paddock

How will the transition feed supplement be fed out? How will intakes of individual cows be controlled?

- Will the transition feed supplement be fed in troughs with hay offered separately or will it be fed on top of the hay?
- What cheap troughing materials could you use? e.g. second hand troughs, tractor tyres
- How much trough space do you need to provide? At least 75cm/cow is recommended.
- What quantities of transition supplement will you need to feed out each day? A small feed hopper and auger mounted on a trailer will make the job much easier.

Manage springing heifers by:

- pregnancy testing them too to get accurate due calving dates.
- putting them in with the springing cows or running them as separate group.





Four keys to successful transition cow management

Don't forget to pregnancy test your yearling heifers too. While they are less likely to suffer from clinical milk fever than older cows, they will also benefit from a well integrated transition feeding program.

1 Get accurate calving due dates

Recent Australian research in commercial herds confirms that the optimal period of time to feed the transition diet pre-calving is around three weeks. (See Figures 5 to 9 on page 25).

Accurately selecting dry cows at three weeks before they are due to calve to enter the transition cow group is only possible with accurate due calving dates, obtained from early rectal or ultrasound pregnancy testing between five and 15 weeks of gestation.

Having accurate knowledge of when cows conceived and their due calving dates also has many further benefits, allowing you to:

- accurately measure 6-week 100-day in-calf rate to assess your overall herd reproductive performance,
- confidently cull cows as empty,
- confidently dry-off cows at your preferred time before their due-to-calve date, identify cows pregnant to AI and those pregnant to the bull,
- identify cows due to calve late,
- more accurately predict calving pattern and milking herd size for the coming months,
- focus heat detection efforts on non-pregnant cows,
- use heat synchrony to induce heats in non-pregnant cows, and
- provide approximate due-to-calve dates when selling cows.

Of course, not all cows calve 282 days following conception. Some calve several days earlier or later. However, if you aim to feed cows the transition diet pre-calving for exactly three weeks, most will receive the diet for about this period of time.

dairyaustralia.com.au/animals/fertility

Pregnancy testing by a skilled operator between 5 and 15 weeks of gestation is the best way to get accurate conception and due calving dates.

DCAD is the Difference between the Cations (sodium and potassium) and Anions (chloride and sulphur) in the Diet.

Anionic salts are commonly included in a commercial transition supplement (lead feed) to manage the DCAD level of the transition diet. Examples of anionic salts are magnesium chloride and magnesium sulphate. Alternatively, commercial anionic feed products such as Anipro®, BioChlor® and SoyChlor® may be used as the source of anions.

2 Design a nutritionally sound, low milk fever risk transition diet

The first consideration when designing a nutritionally sound, low milk fever risk pre-calving transition diet is whether its energy and protein concentrations are sufficient to enable the cow to meet her daily requirements, given her reduced feed intake in the lead up to calving.

Attention should then turn to the diet's mineral specifications – in particular its calcium, phosphorus, magnesium and Dietary Cation Anion Difference (DCAD) levels. The level of each of these four key nutritional parameters contributes independently to the milk fever risk of a pre-calving transition diet, so they are all important.

See Table A on page 31 nutrient recommendations for transition cows.

All varieties of pasture, hay and silage vary widely in their mineral specifications, so 'typical' values provided in reference books can be very misleading. Don't leave it to chance – analyse representative samples of all transition forages. Use an accredited feed lab to check nutritional parameters before using the feed.

When testing feeds to assess their suitability in transition diets, be sure to:

- collect a truly representative sample of the major forage(s) you intend to use in your transition diet.
- request a special transition feed analysis package which includes calcium, phosphorus, magnesium and DCAD analysed using wet chemistry methods – a standard NIR-based feed test won't give you the information you need!

For recommendations on collecting a representative feed sample for testing, and for a list of feed laboratories which service the Australian dairy industry, visit dairyaustralia.com.au

Taking a few grabs out of one or two hay bales isn't good enough. You need to core several bales using a corer to get a representative sample.

Buy your own hay corer so you can use it whenever you want. Many feed labs sell them for about \$300.



Knowing the level in all components of the pre-calving transition diet of calcium, phosphorus, magnesium and DCAD is the only way to accurately assess the diet's milk fever risk.

If buying hay/silage for feeding to your transition cows pre-calving, aim to buy a single consignment from one source and dedicate it to your transition cows.

Due diligence is also required when choosing a transition feed supplement. If the bag tag or brochure for a particular product does not provide you with an approximate analysis for each of the four key nutritional parameters (calcium, phosphorus, magnesium and DCAD) needed to design a sound, low milk fever risk transition diet, look for a product that does.

Calculating the milk fever risk (low, moderate or high) of a pre-calving transition diet is difficult to do by hand without making errors. However, *Dairy Australia's Transition Diet Milk Fever Risk Calculator* makes it quite easy.

Visit dairyaustralia.com.au/resource-repository/2020/07/09/transition-diet-milk-fever-risk-calculator

Who can help?

A ruminant nutritionist, stockfeed company technical/sales representative, veterinarian or farm adviser with nutritional expertise who has completed the Dairy Australia workshop for advisers on transition cow management is best placed to help you design a low milk fever risk transition diet using this calculator.

Take the time to fill in the feed lab's sample submission form properly and tick the box for transition feed analysis.

Unless you can get the sample to the lab within 24 hours, you should freeze the sample.

Unless you can get the sample to the lab within 24–48 hours, refrigerate or freeze it.

Post samples early in the week to avoid mail delays over the weekend. Use an express courier service.

[illegible]

3 Prepare your farm team

A transition feeding program introduces new tasks and different work routines at what is already a very busy time of the year for seasonal and split calving herds.

Is the system for grouping cows based on due calving dates clear?

Are you confident that everyone involved can correctly measure ingredients?

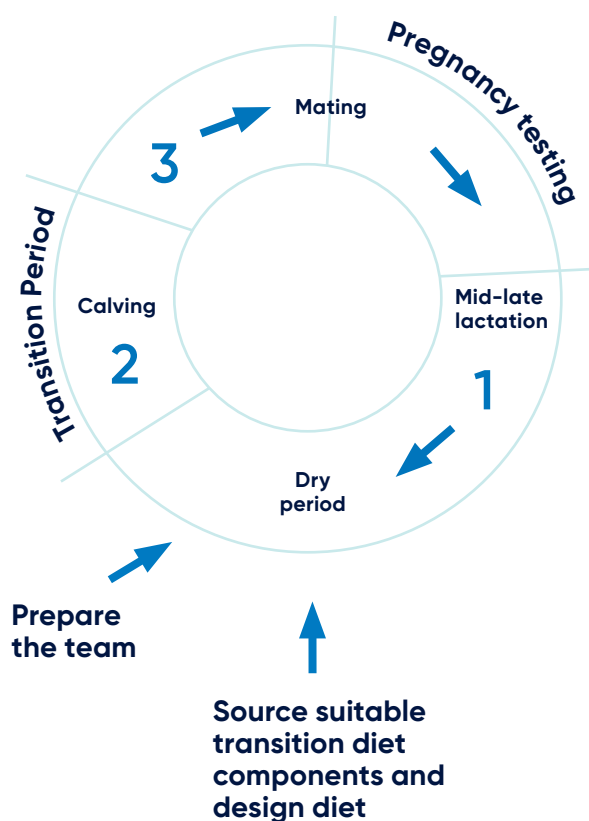
Is everyone trained to observe feeding behaviour and manage feed troughs for minimal wastage?

Too often, these three key points are not adequately addressed, or left to the last minute. They need to be set up well before the transition period commences.

Your adviser can help you clearly define new roles and responsibilities, consider the new skills and procedures involved, write operating procedures, and even assist with staff training.

People appreciate knowing why they are being asked to do things a certain way.

If you take the time to explain to your farm team the benefits to be gained from effective transition feeding and the keys to success, you should get better results.



4 Control your cows' daily transition diet intakes

A common saying among dairy nutritionists is that there are three diets: the one you design, the one you put in front of cows, and the one they actually eat!

Every effort must be made to ensure that each animal in the transition group gets unrestricted access to each component of the transition diet, and eats the quantity intended per day, consistently from day to day.

- At least 75 centimetres of trough space per animal should be provided if grain/transition supplement is fed.
- Adequate access to hay and silage must also be provided.
- If pasture is fed, the area provided per day must be carefully calculated based on the pasture mass available and the number of cows in the transition group.

Are all the boxes ticked on your farm?

For a checklist of the many factors which need to be considered for effective transition cow management, visit dairyaustralia.com.au/resource-repository/2020/07/09/checklist-for-transition-cow-management



Don't let bossy cows like this one monopolise the feed trough!

Provide 75 centimetres trough space per animal in the transition group so heifers and less dominant cows like this one get equal access to the transition feed supplement.

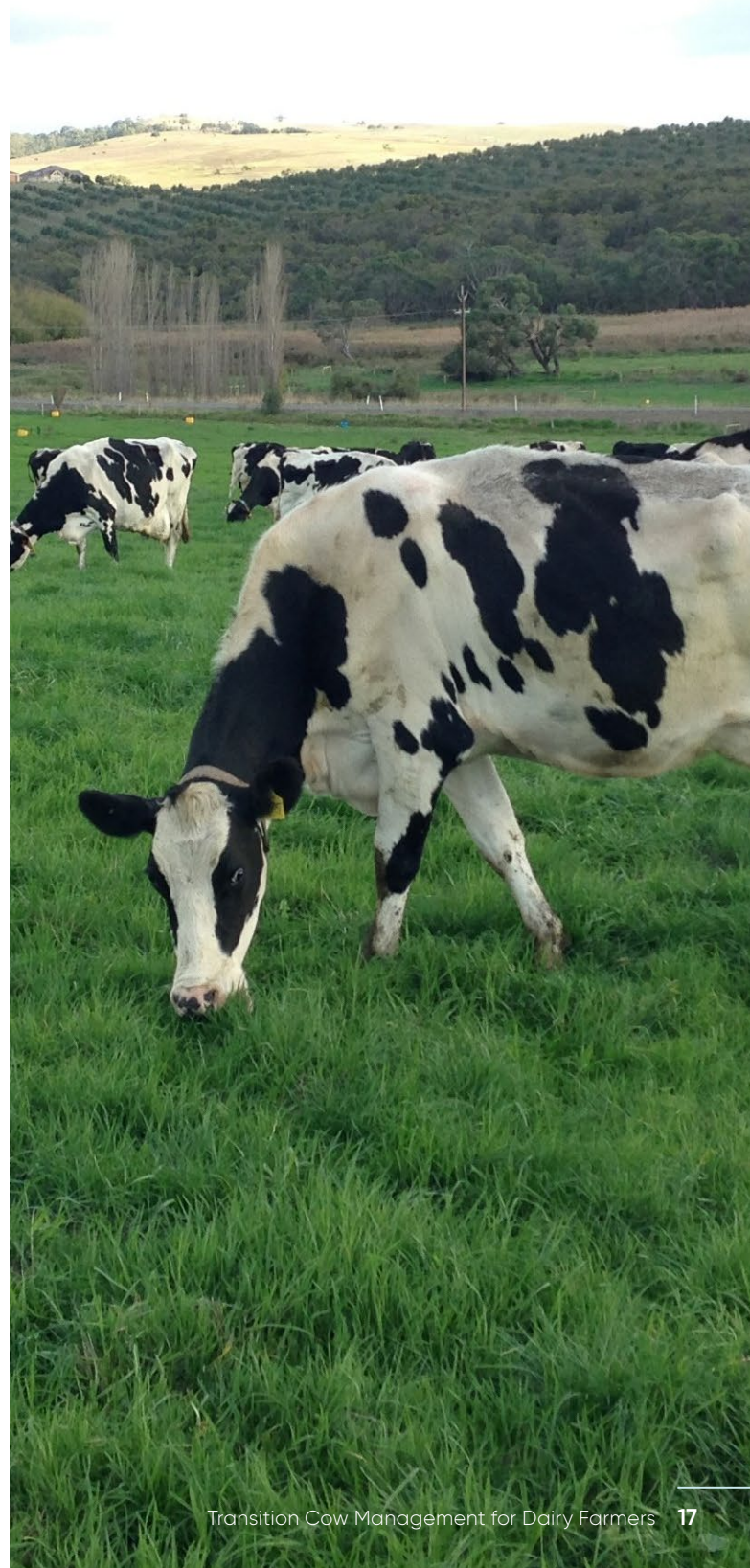


Poor control over daily pasture intakes can easily undo a good transition feeding program.

Carefully calculate the pasture mass available and the number of cows in the transition group. Strip graze as necessary.

Tips from other farmers for making transition cow management easier and reducing waste

- Buy a single consignment of hay silage from one source and dedicate it to transition cows.
- If you lead feed through a herringbone dairy, check to ensure your feeding system is well calibrated and delivering consistent quantities of lead feed to all bails.
- If you lead feed through a rotary dairy, consider installing an extra feed head and silo.
- However you do it, keep it simple for those who have to do the work!
- Look for ways to reduce manual handling of lead feeds. Consider a dedicated lead feed silo. A grain trailer and auger makes feeding out the lead feed in troughs quick and easy.
- Put springing heifers in with the springing cows for the transition period or run them as a separate group to help their rumens adapt and provide them with extra minerals.
- Don't feed lead feed on the ground, use troughs to minimise wastage! Second hand troughs, tractor tyres or conveyor belt are low cost troughing options.
- If lead feeding in the springer paddock, ensure cows have adequate trough space (at least 75 centimetres per cow). Use troughs which are easy to clean.
- Hay rings will reduce waste significantly, especially in wet conditions.
- Consider moving springers into a more sheltered area when they start to approach calving.
- If you have an individual cow ID feeding system, ramp up grain feeding rates gradually over first 5-7 days.
- Consider the feasibility of running a separate fresh cow herd for cows up to four weeks post-calving.



Section 3 Five aims of an effective pre-calving transition diet

An effective pre-calving transition diet has five key aims:

- 1 Meet the cow's increasing demand for energy and protein.
- 2 Maintain dry matter intake.
- 3 Adapt the cow's rumen to the post-calving diet.
- 4 Minimise the risk of milk fever and other health problems.
- 5 Minimise body condition loss and the risk of ketosis and fatty liver.

3.1 Meet cow's increasing demand for energy and protein

Daily requirements for energy and protein increase in the weeks prior to calving as the foetus continues to grow and the body prepares for the onset of lactation.

Given that intakes reduce in the lead up to calving while requirements for energy and protein are increasing, it is important to ensure transition cows are fed a good quality diet.

Example

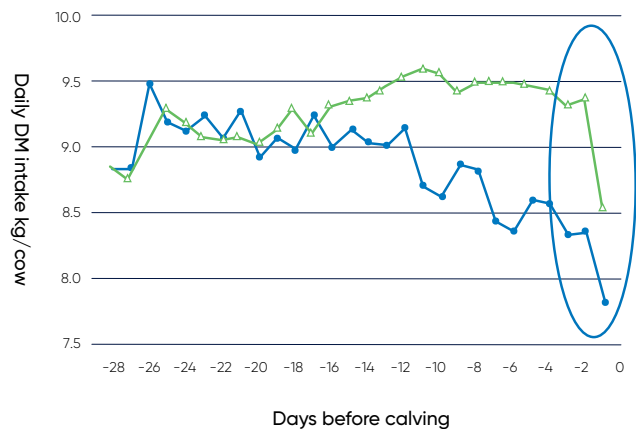
A month before calving, a 550kg cow requires around 90-100 megajoules (MJ) of metabolisable energy (ME) per day and a diet of at least 12 per cent crude protein (CP) on a dry matter (DM) basis.

A week from calving, the same cow needs 100-120 MJ ME per day and a diet of 14-16 per cent CP, and will need a high quality diet to maintain intakes.

While a moderate quality hay (9-10MJ ME/kg DM, 13%CP) may be adequate one month before calving, it will fail to meet the cow's needs closer to calving. With her intake restricted, the cow will need a diet of approx. 11 MJ ME/kg dry matter and 14-16 per cent CP to meet requirements.

Dry matter intake may decline significantly about a week before calving, depending on the quality of the diet. While this can't be prevented, it must be anticipated and managed so it is minimised.

Figure 1 Typical responses in DM intake as calving approaches for cows well-fed with a high quality total mixed ration (Δ) or poor quality hay ($\bullet$)



Source: Stockdale 2007

A guiding principle of transition feeding is that if a particular feed is being fed to freshly calved cows, it should be fed to some level for a full 3 weeks just prior to calving. This ensures an adapted rumen right from calving, allowing cows to "hit the ground running" and not suffer digestive setbacks at the start of their lactation.

As a rough guide, pre-calving transition cows should be fed grain/grain-based concentrate at half the rate fed to the freshly calved milking cows. For example, 3kg per day if freshly calved cows are fed 6kg per day.

3.2 Maintain dry matter intake

Dry matter intake is likely to be the most critical factor in evaluating the nutritional adequacy of a dry cow diet.

Diets with low digestibility lead to greater and more prolonged declines in intake and will not provide adequate nutrients to meet the cows increasing requirements.

It is important to minimise the decline in intake around calving for two reasons:

- There is a positive relationship between intake at calving and intake in the early weeks of lactation, and cows with higher intakes in early lactation should be more productive thereafter;
- Low intake is generally associated with the mobilisation of body tissue, and excessive fat mobilisation often results in metabolic disorders such as ketosis and fatty liver.

If managed well, it is generally only in the last 2-3 days before calving that the greatest decline in dry matter intake occurs, but unfortunately this is when demand is at its greatest. Results of research at Kyabram demonstrate this – see graph on page 23.

Typical responses in DM intake as calving approaches for cows well-fed with a high quality total mixed ration (Δ) or poor quality hay (•).

3.3 Adapt the cow's rumen to the post-calving diet

Dry cow diets have a lower energy density than milking cow diets and a lower content of fermentable carbohydrate, even in pasture-dominant feeding systems.

Introducing cows in the pre-calving transition period to highly fermentable feeds such as grain which they will consume after calving allows the rumen to adapt:

- the rumen microbial populations change, with an increase in the population of starch-utilising bacteria, and
- the papillae lining the wall of the rumen develop, increasing the surface area for absorption of volatile fatty acids and lactic acid.

Rumen microbial populations only take 7-10 days to adapt to a diet change. However, rumen papillae take longer (3 and 6 weeks) to reach full absorptive capacity.

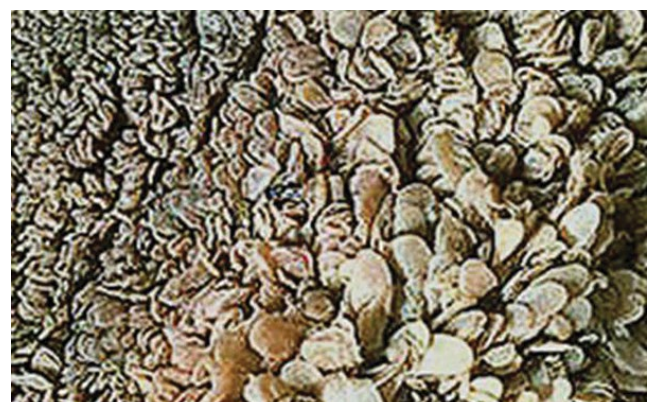
This is why it is so important that when cows are to be fed moderate to high levels of grain/grain-based concentrate after calving that they receive the transition diet for a full three weeks before calving. It is also why getting accurate due calving dates is one of the keys to successful transition cow management.

Adaptation is critical to control the risk of ruminal acidosis (both lactic and sub-acute ruminal acidosis) and the subsequent declines in fibre digestion and intake.

With the exception of macro mineral nutrition, any feed additives (such as rumen modifiers) included in the diet post-calving, should be included in the pre-calving transition diet. But watch out for mineral additives and sodium bicarbonate – these can seriously affect the dietary levels for Ca, Mg, P and DCAD which are so important for reducing milk fever risk.

Mineral requirements for transition cows and milking cows are quite different and it is unlikely that a mineral pre-mix designed for one group will be appropriate for the other.

Figure 2 Rumen papillae before adaptation (top) and after adaptation (bottom)



Source: Veterinary Pathology Unit at the University of Melbourne

3.4 Minimise risk of milk fever and other health problems

Milk fever (hypocalcaemia) is caused by inadequate blood calcium available to meet the sudden increase in demand for calcium at the start of lactation. The cost of milk fever is greater than the immediate costs of treatment and stock loss.

Milk fever is a 'gateway disease' which leads to a higher risk of other diseases, including mastitis, ketosis, retained placenta, displaced abomasums and uterine prolapse.

Milk fever is also a risk factor for reproductive disorders and an indirect risk factor for increased culling.

A low blood calcium level at calving leads to these health problems through a reduction in the cow's smooth muscle function and depression of the cow's immune function.

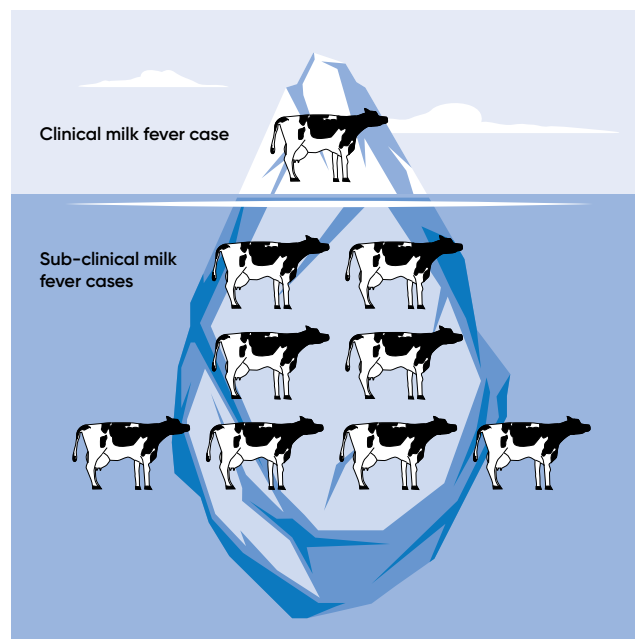
Milk fever risk is not solely related to calcium concentrations in feed. It is also influenced by cow age, breed and condition score and the pre-calving transition diet. The length of time that cows are exposed to the pre-calving transition diet is also important.

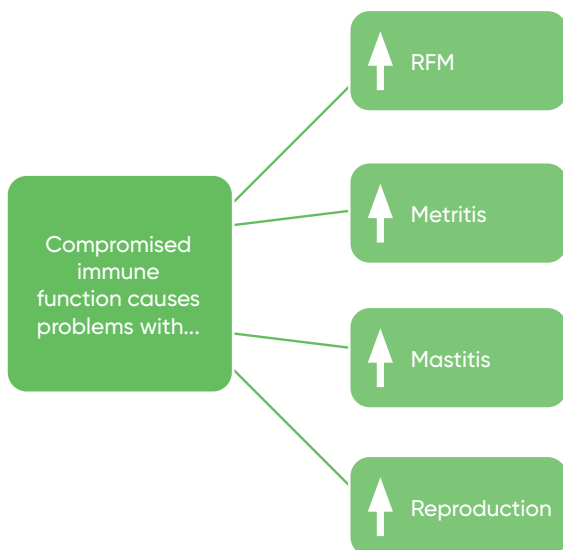
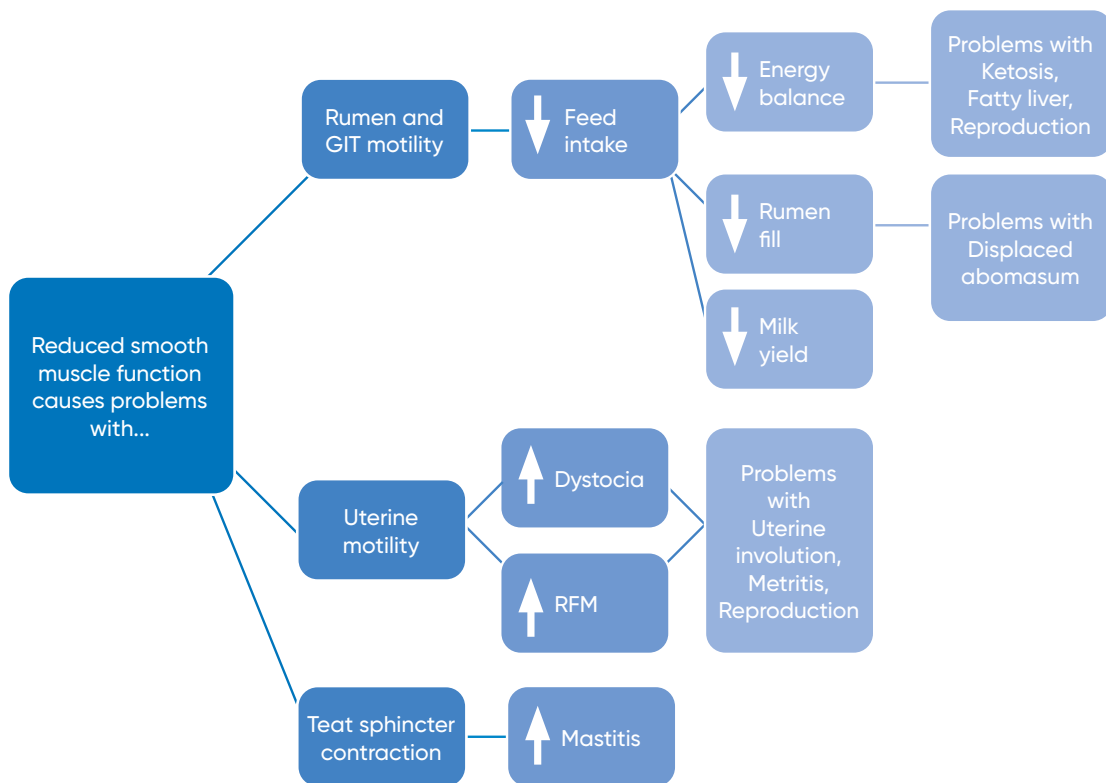
Figure 3 Cow with milk fever



Image courtesy of Dr Jakob Malmo

For every case of clinical milk fever seen in a herd, there may be 8 or more cases of sub-clinical milk fever.





Risk factors for milk fever

Age	Older cows have a higher risk of milk fever than younger cows.
Breed	Channel Island breeds such as Jerseys are more susceptible than Holsteins.
Body Condition	Research shows that high BCS increases risk of milk fever. Note too that cows with BCS 6 or above have reduced dry matter intake pre- calving and take longer to resume high intakes – this leads to greater tissue mobilisation and higher chance of ketosis and fatty liver.
Pre-calving transition diet	At onset of lactation, cow requirement for calcium increases by two to four times. At this time the cow needs to be able to draw calcium back from bone stores and to optimise absorption of calcium from the diet. Magnesium, phosphorus and DCAD also influence milk fever risk. Recommendations: • Less than 0.6% Calcium • Greater than 0.45% Magnesium • Less than 0.4% Phosphorus • Less than 80 mEq/kg DCAD
Time cows are exposed to transition diet	Recent Australian research supports recommendation that the optimum time on the pre-calving transition diet is around 3 weeks. To achieve this it is essential to predict calving dates very accurately. This means early and accurate pregnancy diagnosis is critical.

For further details on feeds commonly used in transition diets, see tables B and C on page 27.

Cows in high body condition scores at calving (BCS 6 or above) have severely depressed appetites immediately before and after calving and are at high risk of developing ketosis and fatty liver.

3.5 Minimise body condition loss and the risk of ketosis and fatty liver

During periods of poor-quality feed intake or a lack of feed, ruminants can mobilise body tissue reserves of fat and protein in support of the foetus and milk production.

Increased tissue mobilisation increases the flow of free fatty acids to the liver for oxidation. This increases the need to export some of these back to body tissues as ketones.

The liver may not be able to re-export sufficient of these and fat is accumulated. This leads to:

- Poor liver function.
- Reduced ability of the liver to produce glucose.
- Ketosis and fatty liver. This is a high risk in fat cows.

Providing a high quality diet during the transition period helps maintain dry matter intakes.

The aim is to provide the daily requirements for energy and protein within the limited intakes achievable in the transition period. This minimises body condition loss.

Body condition score (BCS) targets (Australian eight point scale):

At drying-off:

- Cows in desired condition score profile at calving.
- Cows maintain or gain body condition during the dry period.

At calving:

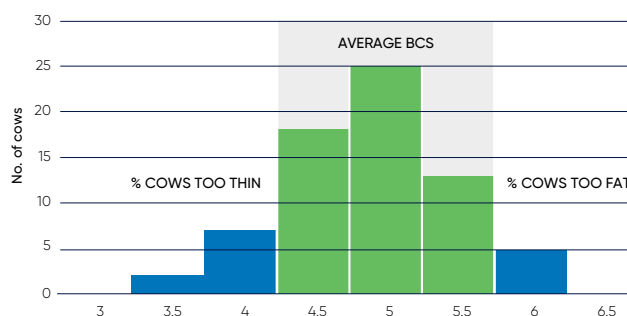
- No more than 15 per cent of cows below BCS 4.5.
- No more than 15 per cent of cows above BCS 5.5.

At mating:

- Average decrease in BCS for the herd since calving is no more than 0.6.
- No more than 15 per cent of cows lose more than one BCS since calving.
- Cows maintain or gain body condition from commencement of mating.

Below is an example of a herd's BCS profile at calving. In this example, the percentage of cows which are below BCS 4.5 and above 5.5 are well within the target of no more than 15 per cent.

Figure 4 Example herd BCS profile at calving



For information and tools to assist you measure and manage your herd's body condition profile visit dairyaustralia.com.au

Section 4 Managing the post calving transition period

While the focus of transition management of the dairy cow (and this booklet) tends to be on the pre-calving transition period, the transition period extends to the first four weeks of lactation, during which the cow's udder continues to develop, her appetite and immune function recover, and her reproductive activity resumes.

All the principles of sound nutrition that are important in the pre-calving transition period are equally important in the post-calving transition period:

- Ongoing adaptation of the rumen to highly fermentable feeds, critical to controlling the risk of acidosis;
- Minimising the depth and length of negative energy and protein balance, and therefore body condition loss, in early lactation; and
- Continuing to meet the cow's daily calcium, phosphorus, magnesium, micromineral and vitamin requirements.

See Table A on page 31 for nutrient recommendations for freshly calved cows.

Useful information, resources and tools

Checklist

Dairy Australia's Checklist for transition cow management lists many key feed, animal, farm infrastructure and people factors, and is a useful aid for you to plan your transition cow management for upcoming calving periods with your adviser, and help ensure that all the important boxes are ticked for a successful program.

Transition Diet Milk Fever Risk Calculator

Dairy Australia's Transition Diet Milk Fever Risk Calculator is an easy-to-use Excel tool which enables you to design transition diets which are low risk for milk fever.

Tally Sheet

How would you know if your farm's transition program is being well managed?

Dairy Australia's Cow health problems at calving tally sheet or wall chart may be a useful aid in recording day-to-day herd health events.

Review Worksheet

By filling in your results versus targets for key performance parameters on Dairy Australia's Transition program review worksheet, you can consider what actually happened (compared to what you planned to do) and decide what you should do differently from now on. (This is best done with help from your adviser).

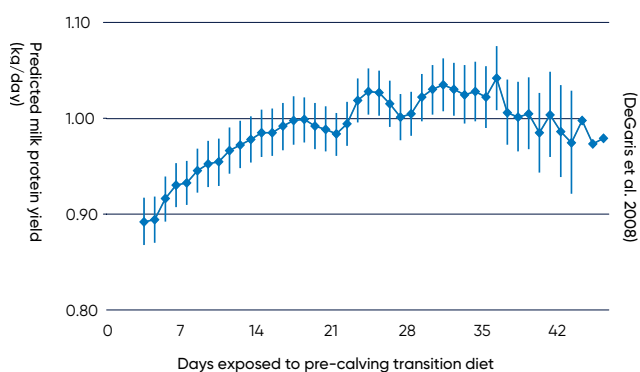
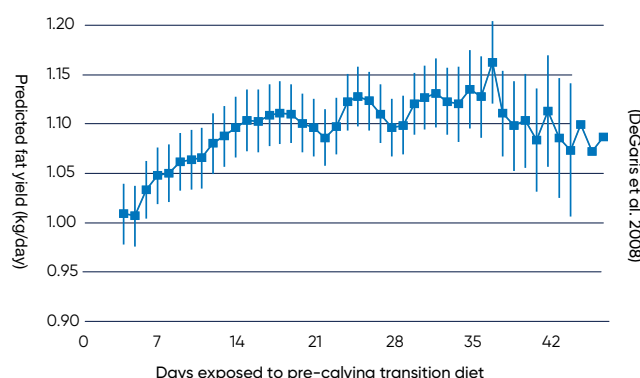
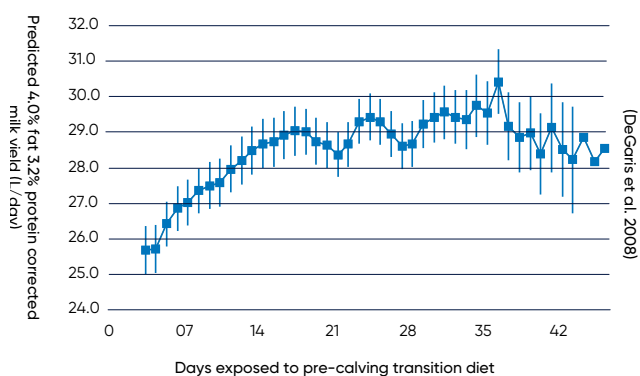
When these resources are used one after the other, they provide a transition cow management Plan – Do + Monitor – Review process, which should foster continuous improvement in transition cow management on your farm, year to year.

To download these resources and tools visit dairyaustralia.com.au/resource-repository/2020/07/09/checklist-for-transition-cow-management

Charts and tables

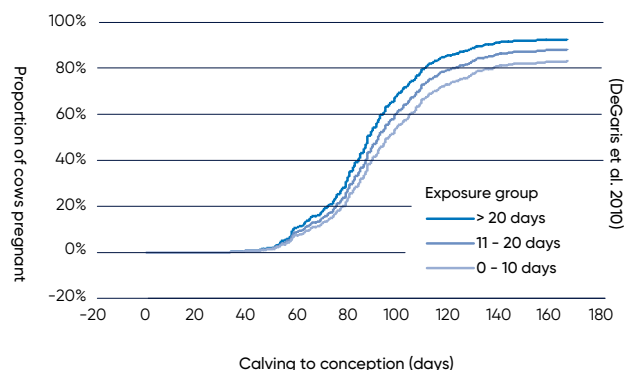
The following charts show results from recent research on Australian dairy farms which support the recommendation of three weeks on a pre-calving transition diet

Figure 5 to 7 Milk yield, fat and protein yields with increasing days exposure to a well balanced pre-calving transition diet



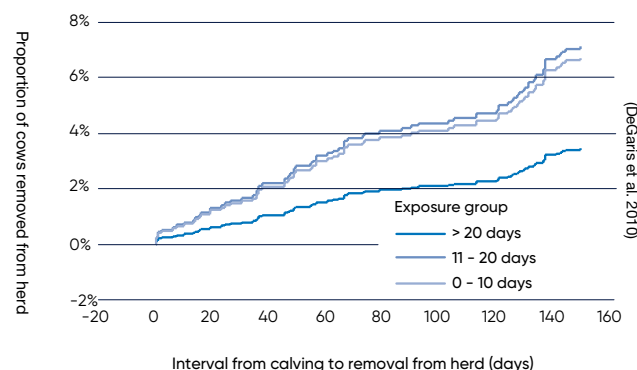
The maximum increases in milk yield, milk protein yield and milk fat yield occurred when cows consumed the pre-calving transition diet for just over 3 weeks.

Figure 8 Reproductive performance



Cows which consumed the pre-calving transition diet for a full three weeks had significantly higher in-calf rates than cows which consumed the pre-calving transition diet for a shorter period.

Figure 9 Risk of culling and death



Cows which consumed the pre-calving transition diet for a full three weeks were much less likely to be culled or died than cows which consumed the pre-calving transition diet for a shorter period.

Pre-calving transition cows have specific nutritional requirements.

Diets intended for early dry cows or for lactating cows are not suitable.

Table A Nutritional recommendations for early dry cows, pre-calving transition cows and fresh cows (dry matter basis)

Nutrient	Total diet analysis (dry matter basis)		
	Early dry cows (More than four weeks pre-calving)	Transition cows (Last four weeks pre-calving)	Fresh cows (First four weeks post-calving)
Neutral Detergent Fibre % (NDF)	> 36%	> 36%	> 32%
Physically effective NDF %	30%	25-30%	> 19%
Crude protein (CO) %	> 12%	14-16%	16-19%
Degradability of CP	80%	65-70%	65-70%
Metabolisable energy intake per day (MJ)	90-100	100-120	160
Estimated energy density (MJ ME/kg DM)	10 (9)*	11	11.5-12
Starch %	Up to 18%	18-22	22-24
Sugar %	Up to 4%	4-6	6-8
Fat %	3%	4-5%	4-5%
Calcium %	0.4%	0.4% to 0.6%	0.8 to 1.0%
Phosphorus %	0.25%	0.25 to 0.4%	0.4%
Magnesium %	0.3%	0.45%	0.3%
DCAD*Meq/kg	< 150	< 80	> 250

Source: Lean and DeGaris, 2010

Pasture, hay or silage from paddocks which have received heavy applications of fertiliser or effluent are likely to be high risk for milk fever due to high DCAD levels and are best avoided.

Only low potassium molasses should be fed to transition cows pre-calving.

Do not feed sodium bicarbonate, or feeds containing sodium bicarbonate, to transition cows pre-calving as sodium bicarbonate has a highly positive DCAD value.

Table B Risk level of feeds commonly used in pre-calving transition diets for milk fever

Low	Moderate	High
Low potassium molasses	Maize silage	High potassium molasses
Grains	Cereal hays (these can still be high)	Pasture treated with effluent
Most grain-based byproducts	Whole cotton seed	Legume pastures
Protein meals		Sodium bicarbonate
Brewers grains		

Source: Lean and DeGaris, 2010

Table C Mineral composition and DCAD of feeds commonly used in pre-calving transition diets (dry matter basis)

Feed*	Ca %	HMg %	Cl %	S %	Na %	K %	DCAD 9mEq/kg DM)	
							Typical	Range
Rye/Clover Pasture	0.63	0.23	2.0	0.28	0.53	3.4	+390	+10 to +750
Kikuyu Pasture	0.34	0.37	4.5	.10	.33	1.96	+680	+10 to +750
Lucerne	1.53	0.31	4.5	.10	.33	1.96	+680	+10 to +750
Oat Hay	0.35	0.16	1.02	0.14	0.42	1.87	+280	0 to +750
Pasture Hay	0.47	0.18	0.66	0.17	0.02	2.00	+230	+10 to +750
Wheat Hay	0.35	0.16	0.53	0.16	0.08	1.77	+240	0 to +750
Grass Silage	0.57	0.22	0.76	0.20	0.05	2.78	+390	+10 to +750
Maize Silage	0.31	0.22	0.32	0.12	0.01	1.22	+150	+5 to +300
Sorghum Silage	0.49	0.28	0.60	0.12	0.02	1.72	+200	+10 to +750
Trit Silage	0.52	0.17	0.75	0.20	0.08	2.90	+440	+10 to +750
Wheat	0.05	0.16	0.09	0.17	0.02	0.41	-20	0 to +50
Barley	0.05	0.14	0.08	0.13	0.01	0.52	+40	0 to +50
Almond Hulls	0.27	0.11	0.04	0.03	0.02	2.65	+660	
Molasses	1.00	0.42	0.75	0.47	0.22	4.01	+620	-10 to 700
Bread	0.20	0.08	1.11	0.16	0.64	0.34	-50	
Brewers Grain	1.32	0.35	0.16	0.09	0.02	0.64	+70	
Canola	0.75	0.51	0.03	0.63	0.09	1.31	-30	0 to +50
Whole Cottonseed	0.18	0.36	0.08	0.25	0.03	1.19	+140	0 to +50
Palm Kernel Meal								0 to +240

Source: Lean and DeGaris, 2010

Mineral composition of forages, and their DCAD value, may vary widely depending on source/fertiliser history/season etc. Forages should therefore be tested before use in pre-calving transition diets, rather than relying on 'book values'.

References and further reading

Cow Body Condition Scoring Handbook, Dairy Australia 2013.

Cow Body Condition Scoring Tool, Dairy Australia 2013. Smartphone app – free download from App store and Google play.

Feeding Dairy Cows, 5th edition Dept. of Economic Development, Jobs, Transport and Resources, Victoria 2015.

Effects of body condition and diet in late gestation on the subsequent health and performance of dairy cows, Stockdale CR (2007) *Australian Journal of Experimental Agriculture* 47, 495–501.

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