Transition cow management

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The transition period is commonly accepted as the period from three weeks pre to three weeks post calving. However, the entire dry period is important and indeed the first 60 days after calving is also a critical window. Regardless of the system, whether a seasonal lower yielding system or a year round higher output system, the principles of transition cow management are the same. Periparturient diseases such as milk fever, ketosis, and displaced abomasums can all be associated with poor transition (see Table 1). The immense negative consequences on the metabolism of the early lactation cow due to failure of the transition period are great. One of the major negative impacts of poor transition cow management is immunosuppression. Poor transition cow management can impact all of the pillars of a successful lactation such as reduced productivity, fertility outcomes or health of the cow.

Disease	Target incidence
LDA	<5%
Ketosis	<5%
Retained foetal membranes	<10%
Milk fever	<5%

Table 1.

BODY CONDITION

Having cows in the correct body conditioning score (BCS) at all stages of the lactation cycle should always be a priority. The most important aspect of dry cow nutrition is to ensure the correct calving BCS. Thus, if BCS corrections are required in late lactation or at dry off, a nutritional strategy should be put in place to ensure an appropriate energy allowance is offered. The recommended BCS for dairy cows at each point of the lactation cycle is depicted in Table 2. The target body condition score at calving is 3.0-3.25. BCS is a subjective task and is an area where a valuable service can be provided by the attending vet practice, whether by vet or technician. The group of cows that calve from March on are most at risk of over-conditioning as this group often have a prolonged dry period. It has been proven that when dairy cows calve down in an over-conditioned state (BCS 4.0, scale 1-5) they have a higher level of BCS loss post-calving, a compromised metabolic state, and a reduced feed intake in early-lactation in comparison to cows with an appropriate BCS at calving (BCS 3.25, scale 1-5) at calving (Alibrahim et al, 2010).

ENERGY BALANCE

THE DRY COW DIET

Dry cows (600kg) require 6.4, 7.1 and 8.1UFL per day when housed three months prior to, two months prior to and in the last month prior to calving, respectively.These requirements assume that cows are dried off with BCS on target (see Table 2). Grass silages are extremely variable in their major nutritional qualities. A very comprehensive study of pit silages carried out in Northern Ireland (Steen et al, 1998) reported huge variation in grass silage quality. When consumed at a typical consumption level by dry cows (1.8 to 2.0% of body weight; Butler et al, 2011), some grass silages will provide an insufficient amount of energy for pregnant dry cows and some will provide too much energy.

Target BCS for dairy cattle at different points of the lactation cycle	
BCS at Drying off	2.75-3.0
BCS at calving	3.0-3.25
BCS at 42 days in milk	2.75 minimum
BCS at breeding	2.75 minimum
BCS in late lactation	2.75-3.25
90% of the herd should meet these targets	

Table 2.

If grass silage quality is poor, cows may lose BCS in the dry period. Furthermore, in years of low milk price and or poor grazing conditions in the autumn, cows may dry-off with a low BCS. In this case, care must be taken to ensure that cows end up with an appropriate BCS of 3.0 to 3.25 at calving (Roche, et al., 2009). Thin cows have been proven to have a significantly increased risk of lameness, uterine health issues and retained foetal membranes. If the low BCS persists to the breeding season, low fertility performance will result (Buckley et al, 2003). If the herd is thin in late lactation (eg. 50% of cows at BCS 2.5 and less), the option exists to dry off cows early, especially in years of low milk price. If dried off early (eg. a

14-week dry period), cows fed average quality grass silage (68 DMD) should have an increase in BCS of approximately 0.5 units before calving. If the low BCS is only noticed at dry off, eight weeks pre-calving, *ad libitum* good-quality or very good-quality grass silage is enough to increase BCS by 0.5 units (grass silage quality 72 DMD and above). With low-quality grass silage or where BCS is very low at dry off (eg. 2.0) concentrate supplementation may be required for dry cows.

TYPE OF ENERGY FOR DRY COWS

There are many theories on why non-structural carbohydrate should be fed to late pregnant dry cows such as developing rumen papillae, acclimatizing rumen microbes and avoiding fatty liver. It is also interesting to note that NRC (2001) advocate a 70% increase in energy density in the close-up dry cow diet.

There is not a lot of research evaluating the requirement for these strategies in grass silage-fed dry cows going to grass post-calving. However, data from Burke et al (2010) for New Zealand dairy cows indicates that feeding non-fibrous carbohydrate in the late pregnant dairy cow diet had no effect on reproduction in grazing dairy cows. In Irish data, McNamara et al (2002) reported prolonged negative energy balance in early lactation as a result of feeding 3kg of concentrate for four weeks pre-calving. It is interesting that a large on-farm study recently completed in Northern Ireland did not find any benefit on milk production, fertility or culling as a result of supplementing concentrates for the final three weeks pre-calving for cows with BCS in the desired range. However, for thin cows, supplementing concentrates in the final three weeks pre-calving reduced the culling rate at 60-days post-calving (AgriSearch, 2010). Thus, the requirement for concentrate in the dry cow diet of most Irish cows (ca 5,000L of milk, 400kg F and P) should be driven primarily by concerns about BCS and silage quality.

The requirement for the development of rumen papillae and to acclimatise rumen microbes for dry cows coming off a grass silage-based diet and receiving 4kg or less of concentrate feed in a grazing scenario, is unlikely to be significant, if BCS is on target. For cows that will be fed 8kg of concentrate or more in early lactation, a conservative approach in keeping with the normal digestive physiology of the cow would be to feed 1kg of starch in the last woweeks pre-calving. This could be 2kg of a dry cow nut, 2kg of barley or 3kg of maize silage or whole crop-wheat silage. This concentrate (starch) feeding at this time may be of increased importance for thin cows.

PROVISION OF APPROPRIATE PROTEIN ALLOWANCE FOR DRY COWS

The requirement for protein (PDI) in the last three months of the pregnancy for dry cows is approximately 475, 535 and 605g/d for a 600kg cow (O'Mara, 1996; Wolter and Ponter, 2012). In most cases, with grass silage only diets this amount of PDI will be supplied.

However, difficulty arises if either the PDIN or the PDIE value of grass silage is less than 60g/kg of DM. Difficulties with PDI provision will also arise where straw or low protein

forages might be included in the diet of the dry cow. It is important that silage is analysed to determine the need for supplementary protein.

Although other feeding standards organisations (NRC, 2001) recommend higher protein allowances than the PDI allowances, research work carried out in Ireland found no benefit to supplementing high levels of protein to dry cows fed grass silage based diets. However, for diets based on grass silage and straw fed in restricted amounts, improvements in milk protein concentration were noted in early lactation following supplementary protein feeding in the dry period (Murphy, 1999). Thus, PDI balances should be calculated based on the farm specific forage(s) used in the dry cow diet, it is likely that supplementary protein may be required for dry cow diets containing straw, low-protein forages such as maize silage or low PDI grass silages.

EARLY LACTATION COW DIET

The early lactation cow is not to be forgotten and the start of lactation is a key time when we must ensure positive metabolic status to ensure optimal health and productivity and later, fertility is achieved.

Grass dry matter intake can vary widely from 5-15kg DM depending on the time of year. Good grazing management is necessary to have an idea what the grass availability is and what is actually being eaten in order that the correct supplementation level is offered. Additionally, the type of concentrate fed in early lactation can have an impact on metabolic status (Whelan et al, 2012) reported that grazing cows fed 6kg of 14% protein compound based on maize had a significantly lower blood urea and betahydroxybutyrate compared to grazing cows fed an 18% protein compound based on barley without any significant effect on the production of milk protein and fat. As many cows will be managed indoors for the immediate early lactation period it is essential, regardless of how big or small the farm, that the early lactation cow diet is calculated to meet energy requirement for the appropriate level of production.

There are a huge number of factors that determine energy allowance for example feed space, weather, grazing conditions, and silage qualities are all important. Whatever strategy is used to feed the early lactation cow, some consideration should be given to determine if nutrient supply is meeting nutrient demands at this crucial time in

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the production cycle. Therefore, grass and concentrate allowances should also be compared to the cows energy requirement using the UFL system.

HYPOCALCAEMIA

Major minerals, trace elements and vitamins are also important and the dry cow diet should include a specific dry cow mineral. Ideally, farm minerals are based on forage analysis and are selected based on what is complementary for the individual farm. Although not common, the UCD Herd Health Group have encountered problems where occasionally some farms may feed the same mineral to milking and dry cows inadvertently or push the milking cow total mixed ration (TMR) in to dry cows, this is important to look at, as the level of calcium for example will be entirely different and can be very dangerous with regard to milk fever control.

Milk fever is a disease that can be often under-reported due to the use of prophylactic calcium and the perhaps masking of the true levels of the disease experienced by some farms. Calcium homeostasis has a key role in the health of the cow at calving, clinical (the tip of the iceberg effect) and subclinical hypocalcaemia have a major detrimental effect on the early lactation cow in terms of health and production. It is not uncommon when questioned about the control strategy used on farms to prevent hypocalcaemia that there is none. Subclinical hypocalcaemia is linked to immune system competence. Roche (2003) demonstrated that even in regions of grazing cows where milk fever is well controlled (incidence rate <5%) that up to 33% of cows may suffer from subclinical hypocalcaemia. In order to test for hypocalcaemia, the timing of the sample is important as it needs to be taken within 24 hours of calving making decent sample sizes difficult (10-12 cows/10% of the group).

The first key area, already addressed, in the control of milk fever is the control of body condition score, maintaining BCS in the desired range at calving is a fundamental point in preventing milk fever. Magnesium supplementation is also important; 20-25g of supplemental magnesium is often required in silage-based dry cow diets. Magnesium plays a key role in the calcium homeostasis of the cow. Another fundamental player in milk fever prevention is potassium. High potassium, as is found in many grass silages, is implicated in the dietary cation anion difference (DCAD) or in simple terms high potassium induces a state of metabolic alkalosis. Metabolic alkalosis can precipitate milk fever through delaying calcium mobilisation from bone around calving and the metabolic consequences culminate in hypocalcaemia.

Additionally, potassium is involved in locking up magnesium which is needed in calcium regulation. Thus, it is vital that the level of potassium in the dry cow diet is understood – which requires mineral analysis of forages. In herds where potassium in the forage exceeds 2.5% of dry matter, a separate milk fever control strategy should be in place. Similarly, grass based dry cow diets are difficult to control mineral intake and therefore can be problematic with regards to milk fever control thus such herds with problems should consider ideally having cows three weeks indoors on a controlled ration pre-calving even if grass is utilised in the far off dry period. The role of minerals in the diet contributing to DCAD can be used to advantage and operation of a partial or full DCAD strategy in the control of milk fever is used successfully on many farms, for this to work the DCAD value of all dry cow diet components is understood and addition of anionic salts to the dry cow diet such as magnesium chloride can help manipulate the diet to induce the metabolic acidosis that is required for optimum calcium regulation around the time of calving. Partial DCAD is another option for control of milk fever if implemented correctly. Whatever the strategy, it is important to consider what preventative measures if any are in place.

The feeding environment is not to be underestimated in the role in the success of the transition period. Feed space is a huge issue and should be accurately measured in any dry cow accommodation. Feed space requirement depends on the weight of the cow and the amount of competition for food, estimates of minimal requirements of 0.6m per cow for a dry cow of 600kg BW or 0.8m for a lactating cow.

Access to clean water is essential and an adequate area where cows can drink that is sufficient for the size of the dry cow area, fresh drinking water is essential to maximise feed intake. Offering fresh feed daily and not letting feed heat up or go off helps with intakes also. Offering feed in the calving area and close up accommodation is useful in milk fever control ensuring the cow has feed in front of her at all times. Cubicle management and stocking rate is also very important in early lactation. Minimising group changes and stressors such as moving to the home farm on the point of caving is another area for consideration. Mixing of heifers who are often naïve to the adult herd endemic diseases if reared off site is a careful consideration and thus in such cases mixing of heifers well before calving or managing as a separate group until after calving could be considered.

MONITORING

It is essential that if we seriously want to assess transition that we assess all areas within our remit so any potential pitfalls can be identified. Walking the farm, measuring feed space, looking at the cows, body condition scoring is very important. We can also monitor some key areas with additional testing. Some recognised targets for disease incidence are included in Table 1. Other key areas for monitoring include monitoring of markers of energy balance – it is advised to measure a cohort at least 10-12 or 10% of large groups of dry cows between five to 15 days pre-calving for NEFA where >0.4mmol/l and BHB where > 0.7mmol/l is indicative of a problem with NEB. Post-calving the ideal window for herd monitoring for NEB is in the days 15-50 in milk, post calving the thresholds are different and NEFA >0.7mmol/l and BHB >1.4mmol/l are indicative of NEB. Milk solids can be used if routine milk recording is practiced to look at low milk protein and high fat:protein ratios in the early lactation group (0-60DIM) as an additional herd screening tool for NEB. No more than 10% of cows 0-60 in milk should have milk fat: protein >1.5 and no more than 10% early lactation cows should have a milk protein <3.05.

In order to increase reliability of monitoring a combination of herd monitoring tools should be used to gain an accurate report of individual farm transition cow management. Transition cow management is central to the productivity, fertility, health and welfare of the dairy cow and is an area where meaningful engagement with farmers can have major positive welfare consequences for the cows and adds momentous value to the veterinary services provided for the farmer.

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