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NDS Dynamics

Ideal Body Condition Score profile in dairy cows

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In the dairy industry, milk yield and reproductive performance are the standard economic barometers for herd profitability. However, these parameters only allow us to draw conclusions on the "management efficiency" at the end of a milking cycle. Thus, the need of using a more dynamic tool to monitor the "fitness" of the herd throughout a lactation cycle to troubleshoot problems and improve the health, longevity, and productivity of the dairy herd has become a must in the last decades.
From its first use, body condition scoring (BCS) has not only proved to be a simple technique based on visual and hands-on assessment but most importantly, one of the most powerful tools in the herd management toolbox.
Because BCS evaluates mainly the thickness of subcutaneous adipose tissue and it is highly associated with fat mobilization (Roche et al.,2009), its main use is to evaluate the animals' energy balance.

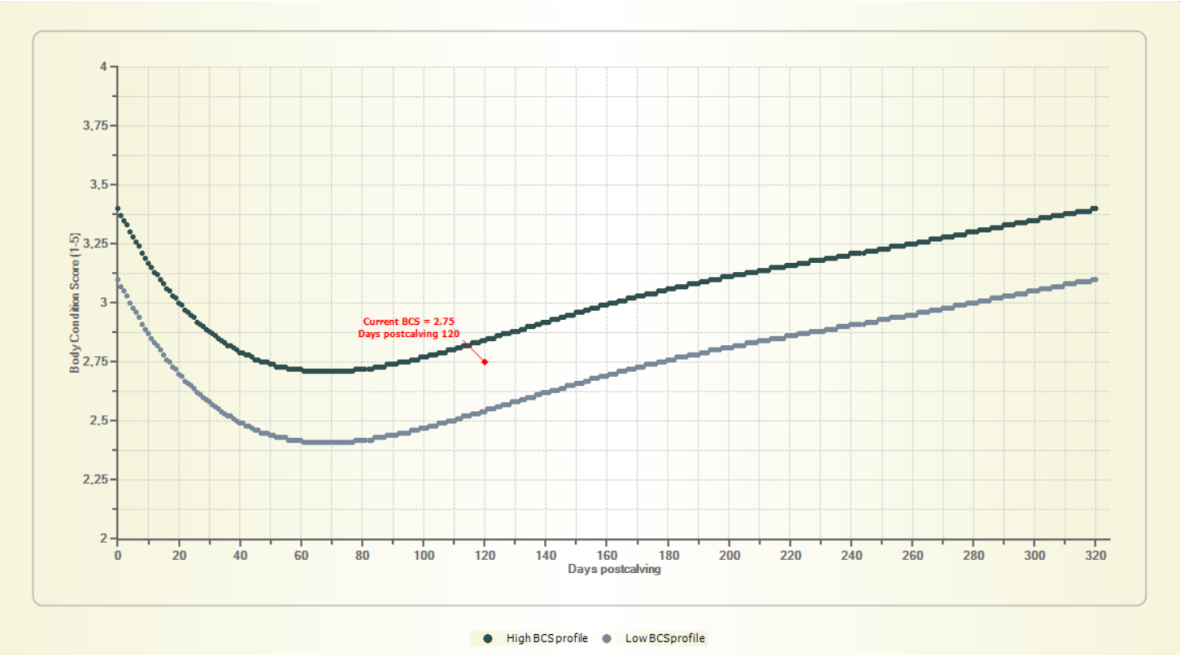
In dairy cows, it has been common opinion to consider the BCS and milk production curves as inversely correlated with the greatest loss of body condition (therefore the most severe negative energy balance) from the beginning of lactation until peak lactation. However, it has been proved that, although a certain degree of body condition loss is to be expected in the early lactation, there is a nonlinear association between the height of the lactation curve and nadir BCS loss (Roche et al., 2009) with dry matter intake (DMI) being instead the primary driver of BCS changes (Barletta et al., 2017). In fact, cows with a BCS of 3.0 to 3.25 at calving produce more milk than those calving either at a lower or higher score. This is most probably due to an increase in the energy available from body stores up to a BCS of 3.25 and the negative effects that BCS higher than 3.5 has on DMI shortly after calving (Roche et al.,2009) with increased susceptibility to metabolic diseases (Roche et al.,2009; Lacetera et al., 2005).
Most of the studies investigating the relationship between BCS and energy balance have focused on BCS from parturition onwards, showing that BCS at calving, its nadir and the postpartum loss of condition are highly associated with health and performance (Roche et al. 2009).
For example, high BCS at calving or a rapid loss in BCS after calving, or both, have been associated with high postpartum circulating NEFA and BHB concentrations (Pires et al.,2013; Adrien et al., 2012) and, consequently, with poor cow health (Roche et al.,2015; Carter et al.,2008) potentially due to a relationship between post-partum energy deficits and immunosuppression (Hammon et al., 2006; Scalia et al., 2006). However, more recently, Barletta et al.,(2017) investigated the role of BCS pre-partum and changes in BCS during the transition period on fat mobilization, fertility, milk yield, and health of lactating dairy cows. From this study, it was observed that the BCS at 21 days before calving determines the BCS loss afterward. In fact, the heaviest cows 21 days before parturition had the greatest BCS loss before calving and continued to lose BCS for the first 21 days post-partum, whereas cows with the lowest BCS 21 days pre-partum gained body condition prior to calving and after parturition. Contreras et al. (2004) also reported that thinner cows (BCS ≤ 3.00) at dry off had the same BCS of fatter cows (BCS ≥ 3.25) 60 days after calving. Furthermore, thinner cows tended to have increased yield of milk, fat and true protein during the first 5 months of lactation.

As stated by Chagas and collaborators in their recent review (Chagas et al., 2007), utilizing the BCS system and the published associations among BCS, reproduction, and milk production (Waltner et al., 1993; Buckley et al., 2003; Roche et al., 2007), it can be postulated that an "ideal BCS profile" for dairy cows would minimize the impact of negative energy balance on reproductive failure while still allowing cows to achieve high milk production".

Therefore the most obvious question is:

How can we define the "ideal BCS profile" and how do we fix it?

According to most guidelines, cows should calve with a BCS between 3.00 and 3.5 with an ideal target of 3.25. In early lactation, the amount of energy a cow can draw from her body reserves depends on her weight and body composition. The common opinion is that high-producing cows can lose about 1 point of condition score and that they should start replenishing their body fat reserves during mid-lactation without exceeding a BCS of 3.25 to avoid overconditioning in late lactation. During this last phase, most guidelines suggest having the cows reaching a BCS between 3.00 and 3.75 with the aim of keeping it constant during the dry period.



However, more recently, these ideal body condition scores have been revised. In fact, although it has been proved that the greatest milk production is associated with a BCS at calving of 3.5, it appears that there is very little increase in milk production by increasing BCS at calving from 3.0 to 3.5 or from 2.75 to 3.00 Furthermore, BCS in early lactation is associated with days to first estrus, (Buckley et al., 2003; Roche et al., 2007) with reported differences in the plasma metabolite profile of cows with delayed ovarian activity consistent with greater BCS mobilization in early lactation (Wathes et al., 2007). These studies, therefore, pointed to an optimum early lactation BCS between 3.0 and 3.25 for a successful return to estrus. Thus, a BCS at calving between 2.75 and 3.25 (ideal BCS 3.00) results to be the best compromise for optimal milk production and reproductive performance.
Additionally, during the early lactation, loss of body condition should be minimized aiming at losses not higher than 0.5 to 1.0 point of BCS.

If BCS is routinely used to monitor the status of the herd, interventions could be made to "adjust" the BCS to ensure optimal score at calving. Late lactation is the optimum time to manipulate body condition. During this period cows should be in a positive energy balance and confirmed pregnant by this time, and changes in body condition can be made very efficiently. If cows have BCS < 2.75, energy intake needs to be increased to ensure adequate energy post-partum for lactation and ovarian activity. If BCS exceeds 3.5, energy intake needs to be reduced to avoid excessive fattening and metabolic diseases post-partum. It is thus important to continue providing quality protein and energy sources, making sure that the protein balance exceeds the energy balance, and adjusting the levels to meet nutritional requirements as needed to maintain adequate score levels.
If cows enter the dry period with a high BCS it then becomes more difficult to reduce it without compromising intake or causing excessive fat mobilization during the transition phase. If, on contrary, the animals enter the dry period with low BCS, feeding high ME ration with the objective of increasing the BCS at calving, could compromised the health of the transition

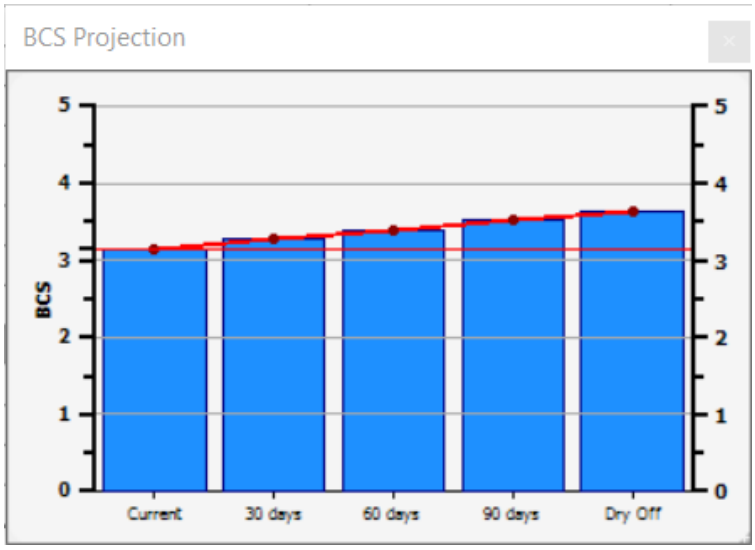
cow. In fact, high ME dry cow rations will not result in visible changes in BCS in a short term for up to 8 weeks, but create larger mesenteric and omental adipose fat deposition (Drackley et al., 2014). Because previous in-vitro studies have proved that lipolysis among adipose depots vairy in the order omental > subcutaneous > mesenteric > perirenal (Pike and Roberts, 1984), it can be speculated that excessive accumulation of mesenteric and omental adipose depots will be highly mobilized post-partum thus "flooding" the liver with NEFA (Reynolds, 2002) and increasing the risk of fatty liver syndrome in the fresh cows.

Although NDS proposes a BCS curve based on the currently accepted guidelines, the newer suggested guidelines are under evaluation for possible updates in the near future.
The system is not static allowing the user to set current BCS, target BCS, and days to reach target BCS, through the "Animal Input" screen.

BCS (1-5)		2,75		BCS 30d 2,85	BCS 60d 2,95
Target BCS		2,85			
Days to reach target BCS	days	30			

In order to maintain a high level of accuracy, it becomes of primary importance with CNCPS 6.55, to accurately evaluate the energy balance and the expected changes of BCS.

Based on the inserted values for current BCS and the inputs about the formulated diet, mostly related to the calculated energy balance, NDS shows the projections of BCS in a short (30 days), medium (60-90 days) and long term (at dry off).



Thanks to this approach, it becomes easy and consistent with the current diet, to adjust Target BCS according to the expected projections, that are strictly related to the estimated energy balance.

Send us your comments on this topic! Dave Weber is at rumendvm@gmail.com; RUM&N Staff is at info@rumen.it

Note that the features and utilities developed by the NDS team described above are not components of the underlying CNCPS model, and do not change the CNCPS outputs or results. *Questions about the use of these features should be directed to the NDS support team, and not to the CNCPS group at Cornell.*

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