

Barley Straw in Starter Before and After Weaning in Holstein Calves

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Previously, a study was reviewed which included corn silage in a total mixed ration (TMR) for preweaned dairy calves (Kertz 2023; Toledo et al., 2023). More commonly some forage is added with pelleted or meal form calf starters to avoid marginal rumen acidosis and reduced intake and daily gain. In all studies with added forage in young calves, gut fill is the unacknowledged or unmeasured major variable. And too often whether the calf starter is pelleted or well-texturized is not considered in evaluating the study and its field application. A study was done in which a pelleted starter was fed with either forage added as alfalfa hay or barley straw (Antonio-Tort et al., 2023).

Forty-five Holstein calves (97 ± 12.6 lb BW and 3 ± 1.5 days of age) were purchased from a commercial farm and raised at a Spanish research institute facility. Calves received 3.5 L of colostrum within 6 hours of birth at the farm. They were housed in individual pens bedded with sawdust, and during the postweaning period (57 to 91 days of the study) they were moved to a larger pen within the same barn, maintained individually separated, and also bedded with sawdust.

Calves were distributed by body weight (BW) in blocks of arrival date, and were randomly assigned to an individual pen and into 1 of the 3 treatments (12 males and 3 females): calves fed barley straw in pre- and postweaning periods (S-S); or barley straw during the preweaning and alfalfa hay during the postweaning period (S-A); or alfalfa hay in the pre- and postweaning periods (A-A). In the preweaning period, all calves were fed the same milk replacer (MR; 25% CP 19% fat DM basis) that was offered in nipple-bottles twice daily at 0800 and 1600 hours. Calves received 4 L of MR at 12.5% solids, 5 L, 6 L, and 6 L at 15.0% solids during 0 to 3, 4 to 7, 8 to 14, and 15 to 49 days on the study, respectively. From 50 to 56 days of the study, calves received 3 L of MR at 15.0% solids in the morning feeding and they were weaned at 57 days. Calves received a pelleted starter (18% CP, 15% NDF, 58% calculated non fiber carbohydrates--NFC) offered ad libitum during the preweaning period, but the grower fed during postweaning of 9 to 13 weeks had 17% CP, 22.9% NDF and 51% NFC. Amount of forage offered was adjusted every day to represent 7.5 and 15.0% of total solid feed intake on the previous day during the pre- and postweaning periods, respectively. Alfalfa hay and barley straw were chopped using a forage chopper machine, and provided in a separate bucket from the starter. The particle size distribution of forage offered was quite different with barley straw having 19% >20 mm, 21% 8-20 mm, and 60% <8 mm versus alfalfa hay at 70% > 20 mm, 7% 8-20 mm, and 21% < 8 mm. Refusals by each calf were determined every week using a 2-screen Penn State Particle Separator.

Results in **Table 1** are not different among treatments except for postweaned intake of the S-S treatment being greater versus the other two treatments.

Table 1. Intakes of treatments fed different forage sources preweaned-postweaned.

Treatment	Straw-Straw	Straw-Alfalfa	Alfalfa-Alfalfa
Milk, lb/day, DM	1.60	1.64	1.66
Starter/grower, lb/day DM			
1 to 8 weeks	1.02	0.99	0.86
9 to 13 weeks	7.52	6.26	6.17
Forage, lb/day DM			
1 to 8 weeks	0.07	0.06	0.05
9 to 13 weeks	0.44	0.49	0.40
Forage %			
1 to 8 weeks	7.01	6.69	6.60
9 to 13 weeks	5.08	6.63	6.38
Total DM intake. lb /day			
1 to 8 weeks	2.75	2.69	2.57
9 to 13 weeks	6.96	6.75	6.58

Data in **Table 2** for daily gain are not different among forage source treatments. Hip heights (not shown) are also not different among treatments. Observations were made of behavioral activity with some differences among treatments for more time ruminating, less time lying, more time standing, and less time drinking water for treatment of straw fed before and after weaning versus for the other two treatments.

Table 2. Body weight gains for treatments fed forage sources preweaned-postweaned.

Treatment	Straw-Straw	Straw-Alfalfa	Alfalfa-Alfalfa
Initial body weight, lb	100.6	97.3	94.0
Daily gain. lb			
preweaned 1- 8 weeks	1.79	1.72	1.66
Postweaned 9-13 weeks	2.88	2.43	2.68
EBW gain¹ estimates. lb/day			
Preweaned 8 week	1.42	1.37	1.31
Postweaned 13 week	2.59	2.18	2.41

¹Empty body weight gain estimate (Jahn and Polan 1976),

Caveats. Comments, and Questions:

- **Forage particle size.** The particle size distribution of forage offered was quite different with barley straw having 19% >20 mm, 21% 8-20 mm, and 60% <8 mm versus alfalfa hay at 70% > 20 mm, 7% 8-20 mm, and 21% < 8 mm. So, is there a forage source difference or a particle size difference between forage sources? Alfalfa leaves are fragile and shatter often resulting in some of their loss in final mixes. Maybe the calves simply do not like the stemmier chopped alfalfa?

- **Gut fill.** The authors did attempt to estimate empty body weight gain, but the equation used (Jahn and Polan 1976) was based on 8 to 20 week calves and varied in orchard grass hay versus this study. Thus, the calf age range and source of forage were quite different between these 2 studies and inappropriate. The study of Khan et al. (2011), was cited and it did measure gut fill. That study used a poorly texturized calf starter which when hay was also made available resulted in the erroneous title and conclusion. While provision of hay did improve rumen pH (**Table 3**), it created gut fill which confounded and actually resulted in less true body weight gain. *Yet, I have not seen anyone who cites this study referenced with this key result!*

Table 3. Effect of hay intake along with starter on gut fill.

	Starter	Starter/hay	P <
Rumen-reticulum + digesta, lb	17.6	12.7	0.02
Rumen-reticulum – digesta, lb	1.6	1.9	0.03
Rumen pH	5.06	5.49	0.002

- **Why not measure gut fill?** In this study, 80% of calves were males calves. A subset of 3 or 4 calves per treatment could have been sacrificed for such measurements as was done by Porter et al., (2007). Rather ruminal contents and epithelium were sampled and analyzed for rumen gene expression. The obvious measurement was overlooked.
- The **physical form of the calf starter** can predetermine results. As a reviewer of journal manuscripts, I have often found this to be the case even though the authors did not recognize this. There was considerable day to day feeding and calculation of forage intake in this study. Dairy producers and calf operations when feeding pelleted starters often do so because they often cost less than well-texturized calf starters. But do they really? What does it cost to buy suitable quantities of barley straw—if you can find it? And then you have to store it, buy a chopper to chop it and consistently, and then blend it on a consistent basis with the pelleted starter. What does all of that cost—including labor time? How many operations are looking to add any facet to their operation, manage it, and cost account for it?

The Bottom Line

Results of this study only apply to using a pelleted calf starter and feeding with chopped barley straw or alfalfa hay. How many dairy or calf operations can afford to do this and do it consistently well? Feeding forage especially to preweaned calves can create more gut fill which is either not measured, ignored, or both. This can also decrease intake and daily gain.

References

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