

Abstract# T127

Introduction

- Residual feed intake (RFI) is the difference between actual and predicted feed intakes (Pryce et al, 2012)
- Heifers consuming high-quality forage diets are more susceptible to excessive weight gains and over-conditioning (Coblenz et al, 2015)
- Limit feeding is an option to control nutrient intakes and weight gain of heifers, as well as reducing manure output and improving feed efficiency (Hoffman et al., 2007)
- Potential differences in feed efficiency of growing dairy heifers due to predicted RFI as a lactating cow is not known when heifers are limit fed.

Objective

- To evaluate growth and feed efficiency of dairy heifers differing in predicted genomic residual feed intake as a lactating cow (RFI) and either fed ad-libitum or limit-fed.

Materials and Methods

- Post-bred Holstein heifers (128, ages 14-20 months) were blocked by initial weight into 4 weight blocks
- Each block was sorted by RFI (high and low) to obtain 2 pens of high and low predicted RFI for each block (8 heifers per pen)
- Two treatment diets were offered. The control diet (CON) contained corn silage and alfalfa silage and was fed for ad libitum intakes (2-3% refusals). The limit fed diet (LIMIT) was fed at 90% of CON intakes with the diet similar to CON with addition of ground corn and soybean meal to obtain similar nutrient intakes as CON.
- Each treatment was randomly allocated to blocks to obtain a 2x2 factorial arrangement with 2 RFI levels and 2 diet treatments.
- Diets were offered in a 120-d trial
- Measurements (weight, BCS, heart girth, hip height) were taken at the beginning and end of the trial
- Whole pen manure collections were performed at week 9 and week 16 to obtain dry matter and NDF digestibility
- Statistical analysis was performed using a MIXED procedure in SAS 9.3 with pen as the experimental unit.

Results

Table 1. Ingredient composition and nutrient composition of TMR

Item	Diet	
	CON	LIMIT
Ingredients, % of DM		
Corn Silage	30.8	31.4
Alfalfa Haylage	67.5	49.9
Ground corn	-	10.8
Soybean meal	-	6.0
Urea	0.41	0.41
Mineral supplement	1.30	1.45
Nutrients, % of DM		
Crude protein (CP), %	12.7	13.4
Neutral detergent fiber (NDF), %	47.8	42.7
Total digestible nutrients (TDN), %	59.2	62.4

Table 2. Intakes and growth for heifers with different RFI and fed ad libitum or limit fed

RFI treatment	Low		High		SEM	<i>P</i> =			
	Diet treatment	CON	LIMIT	CON		LIMIT	RFI	Diet	RFI x Diet
DM, kg/d		10.8	10.0	11.2	9.9	0.17	0.39	0.01	0.34
DM, % of BW		2.06	1.96	2.14	1.92	0.041	0.64	0.03	0.25
CP, kg/d		1.38	1.33	1.43	1.33	0.022	0.37	0.04	0.35
NDF, kg/d		5.1	4.2	5.3	4.2	0.08	0.38	<0.01	0.35
NDF, % of BW		0.98	0.83	1.02	0.81	0.021	0.67	<0.01	0.29
TDN, kg/d		6.4	6.2	6.6	6.2	0.10	0.38	0.07	0.34
ME, Mcal/d		11.2	10.9	11.6	10.9	0.18	0.40	0.07	0.33
Daily gain, kg/d		0.91	0.82	0.86	0.78	0.005	0.01	<0.01	0.63
Feed Efficiency, kg intake/kg gain		12.0	12.3	12.9	12.7	0.12	0.01	0.70	0.24
BCS gain		0.02	0.13	0.04	0.10	0.084	0.96	0.37	0.77
Height gain, cm		3.9	4.1	3.8	4.1	0.89	0.94	0.76	0.95
Girth gain, cm		12.5	9.4	11.3	9.0	1.04	0.50	0.08	0.68
DM Digestibility, % DM		53.4	57.8	55.3	57.8	1.18	0.50	0.06	0.53

Summary

- Dry matter intake (DMI) was affected by diet (11.0 vs 10.0 kg/d for CON and LIMIT, respectively; $P=0.01$), but not by RFI ($P=0.39$)
- Average daily gain was affected by RFI and Diet but not their interaction. Low RFI heifers had greater ADG ($P=0.01$) and heifers fed ad libitum (CON) had greater ADG than LIMIT ($P<0.01$)
 - The greater gain for CON may be due to greater energy intake or digesta fill when fed for ad libitum intakes.
- Feed efficiency was better for Low RFI than High RFI heifers ($P=0.01$), however limit fed heifers were not more efficient than CON due to lower body weight gains.
- Body condition score and height gain were not affected by diet or RFI ($P>0.37$)
- Diet digestibility was greater for LIMIT than CON likely due to greater concentrates in the diet and/or longer rumen retention time.

Conclusions

- Feed efficiency of heifers having a low genomic RFI predicted as lactating cows was better than heifers with high genomic RFI and was not dependent on being fed for ad libitum intake or limit feeding
- Both the ad libitum and limit fed heifers had daily gains within guidelines for heifer growth of 0.8-1.0 kg gain/day. The greater gains for CON may be due to greater energy intakes or greater gut fill when fed for ad libitum intakes.

References

- Coblenz, W.K., N. M. Esser, P.C. Hoffman, and M.S. Akins. 2015. Growth performance and sorting characteristics of corn silage-alfalfa haylage diets with or without forage dilution offered to replacement Holstein dairy heifers. *J. Dairy Sci.* 98:8018-8034.
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- Pryce J.E et al. 2012. Accuracy of genomic predictions of residual feed intake and 250-day body weight in growing heifers using 625,000 single nucleotide polymorphism markers. *J. Dairy Sci.* 95:2108-2019.