INTAKE MANAGEMENT

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Introduction

Intake management has been an area of continual scientific research and field studies. As an industry we have shifted our paradigm from maximum feed intake improves efficiency of production and profits. To acknowledgement that faster growing steers do not have higher intakes than cattle gaining at average rate (Meissner et al., 1995). In fact, review of intake research shows a clear trend for improved efficiency with increased degree of restriction of intake (Sainz, 1995). However, there remains a complex relationship between feed intake, feeding behavior, acidosis and performance. Along with poor correlations between feed intake, gain and/or feed efficiency (Gill et al., 1986; Meissner et al., 1995). A widely accepted paradigm for feedlot cattle is limitation of feed intake, where wide swings in daily intake are avoided and reasonable feed intake is maintained for extended feeding period. This limitation of feed intake improves feed utilization, reduces incidence of sub-clinical and clinical acidosis and subsequently improves feed efficiency (Loerch and Fluharty, 1998; Bierman and Pritchard, 1996).

Program feeding during various feeding phases has been researched. However, majority of the research restricted feed during the step-up phase and but fed ad-libitum thereafter. Thus restricting intake during the step-up phase did not reduce performance if cattle were fed ad libitum during the finishing phase (Loerch and Fluharty, 1998). The question posed at the 1995 Feed Intake Symposium remains, can manipulation of intake improve efficiency of feedlot animals and remove impact of season on performance? Holstein steers are an excellent breed of cattle to evaluate this question. Holsteins are creatures of habit and they have been genetically selected for high milk production and subsequently high intake. Thus, the Holstein is a breed where programmed feeding could yield better efficiency.

Intake management by definition is delivery of a consistent, nutritious, fresh ration in a manner that optimizes fed intake and minimizes waste spoilage. Thus intake management includes feed mixing and delivery in contexts of quality, quantity and time. Intake management has to be responsive to type of diet, class of cattle, and changes in climatic conditions. As stated by Horton (1990), proper intake management poses a tremendous challenge in that the person responsible must make decisions for an uncooperative, mostly unpredictable, mute, biological organism that exists in an uncooperative, mostly unpredictable environment and consumes a commodity that has relatively short shelf life. Programmed feeding system may help put structure to an art and put prediction into some of the unpredictability. Following a programmed feeding strategy with Holstein steer calves can help manage intakes, reduce incidence of sub-clinical and clinical acidosis, preclude them to consume the balanced ration, help reduce sorting and feed wastage, and improve feed efficiency.

Materials

We had a database from Big Gain, Inc. of Holstein steer calves fed in southwest Minnesota and northwest Iowa feedlots. The database consisted of 3,788 head with average in weight of 162 kg and finished weight of 622 kg. The Holsteins were fed an average of 349 days with average daily dry matter intake of 8.75 kg, average daily gain of 1.33 kg, and average gain efficiency of 0.152. There were 18 groups of Holsteins fed with average of 210 head per pen. The Holstein steers were fed at six different feedlots. Holstein steers originated from various geographical locations and from various calf raisers.

All rations were formulated to have similar nutrient profile. The energy of the rations ranged from 52 Mcal NEg at start through 61.5 to 62 Mcal of NEg on the finishing phase with 6.5 to 9% acid detergent fiber level in the finishing phase rations. All rations were formulated to meet or exceed metabolizable and degradable protein requirements for appropriate weight of cattle.

All Holstein steers were implanted at similar days on feed. The initial implant was a low dose implant followed by two moderate dose, combination hormone implants. All Holstein steers were fed by programmed feeding system that incorporated a slick bunk management system. Each feedlot had single person that managed feed intake and did best job could at following programmed feeding system. All feedlots had 10 to 12 inches per head of bunk space. All feedlots fed the Holsteins in open lots with majority of feedlot pen surface as cement. Each pen had ample wind protection and adequate management of bedding. Two groups (12 and 13) of Holstein steer calves were fed in monoslope building facility.

Within the database 50% of the feedlots fed a by-product, which typically comprised 20% of the ration on dry matter basis; 83% of the feedlots processed their corn; and 16.7% fed high moisture, dry rolled corn blend in finishing phase.

Discussion

Daily dry matter deliveries were plotted for each group of Holsteins, there was no slump in daily feed deliveries throughout the feeding period. Feed deliveries had gradual increase of intake to about 162 days on feed. At 162 days on feed, intakes plateau and held consistent until cattle were harvested. Intakes did not increase in correlation to implanting. No seasonal impact was observed on intake. The Holsteins were on feed for basically a year, season nor weather influenced daily dry matter deliveries.

These results contradict historical data on intake patterns of cattle. Hicks et al, (1986) reported a seasonal dry matter intake pattern, where cattle typically had peak intake in late fall (October and November) after which feed intake decreased to low point in February. Then, intake increased to a peak in May and June followed by a decline in

July and August. The difference in data may be due to the same pen of animals being fed for entire year versus 2 ½ turns of cattle, or due to the programmed feeding system. Edlin et al. (1985) observed that estrogenic implants increased feed intake during the first week after implantation and for the remainder of the feeding period. We did not see increased intakes in direct correlation to implanting episodes. However, we do not know if overall intake was increased due to implant because all Holsteins in the database were implanted.

We categorized each group of Holsteins into top 1/3, average, and bottom 1/3 based on dry matter deliveries, feed efficiency and average daily gain (Table 1). Dry matter deliveries, feed efficiency and average daily gain had poor correlation. Previous intake studies have shown similar results (Gill et al., 1986; Meissner et al., 1995). Holstein steers that had greatest dry matter intake typically had poor feed efficiencies. Holstein steers that had greatest average daily gain had dry matter intakes in top 1/3, average and bottom 1/3 categories. Meissner et al. (1995) saw similar result, steers with greater live weight gain consumed no more feed than steers gaining at slower rates. Holsteins fed by-products did not have greater dry matter deliveries nor better performance (Table 1).

To evaluate if restriction of daily dry matter deliveries affected performance, we compared the greatest 1/3 dry matter deliveries to lowest 1/3 dry matter deliveries. The lowest 1/3 consumed 14.66% less than greatest 1/3 (8.05, 9.43 kg, respectively). We evaluated the feed efficiency of the greatest 1/3 and lowest 1/3 intake groups. The lowest 1/3 intake group had 14.6% improvement in feed efficiency compared to greatest 1/3 intake group (6.05, 7.08 respectively). The lowest and greatest 1/3 intake groups had same average daily gain (1.33 kg). This demonstrates that programmed feeding that restricts daily dry matter feed deliveries can improve feed efficiency, train the Holstein to be satisfied with less amount of feed and consume the formulated ration. All factors that improve profitability in the feedlot.

Previous intake research has shown contradicting performance response to imposed variable intake (Galyean et al. 1992, Zinn 1994, Cooper et al. 1998). We evaluated the database for coefficient of variation for entire feeding period (Table 2). Coefficient of variation ranking was correlated with feedlot more than performance parameters. Note, the use of by-product had minimal impact on variation.

Peters (1995) showed a large number of feedlot observations, where we “overfed” cattle during the first 5 to 14 days. Increased morbidity and mortality are often noted following large increases in dry matter consumption. Cole (1993) postulated that metabolic stresses induced by overfeeding newly arrived cattle may have a negative impact on the immune response by animals. This may trigger subacute or acute acidosis for the remainder of the feeding period. Thus we evaluated the coefficient of variation for the initial 28 days on feed (Table 3). The groups of Holsteins with top 1/3 greatest variation did have the poorest cumulative feed efficiency. The average amount of variation had average to slightly above average cumulative feed efficiency. While the lowest amount of variation had mix of average to best cumulative feed efficiencies. The data demonstrates the importance of getting cattle started on feed correctly. This amplifies the need to program feed cattle, especially during initial days on feed. If cattle are not started on feed correctly their entire feeding period and performance maybe negatively impacted.

Conclusion

By following programmed feeding system for Holstein steer calves we were able to control wide swings in daily intake, decrease subclinical acidosis, decrease clinical acidosis, and maintain reasonable feed intake for extended feeding periods. We limited the increase in feed offered daily by using predetermined schedule of intake that was adjusted depending on background of cattle, weather and previous history of intakes. We manipulated intakes and removed the impact of season and implant, and eliminated typical slump and bell shape intake patterns. This resulted in overall good performance for all groups of Holsteins. Holstein steers are creatures of habit, making them an excellent type of animal for programmed feeding system.

The author would like to note the database and conclusion drawn within the paper are from field work not properly designed research study.

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Table 1. Categorized Cumulative Feedlot Performance.

Dry Matter Deliveries, kg				Average Daily Gain, kg				Feed Efficiency, g/f			
Top 1/3				**Top 1/3**				**Top 1/3**			
Producer	**Group**	**By-Prd[a]**	**DM Deliveries**	**Producer**	**Group**	**By-Prd**	**ADG**	**Producer**	**Group**	**By-Prd**	**g/f**
a	11	N	9.78	b	1	Y	1.42	b	1	Y	0.177
a	10	N	9.50	b	13	Y	1.38	b	5	Y	0.166
a	8	N	9.39	a	8	N	1.37	b	12	Y	0.165
b	13	Y	9.34	e	17	Y	1.37	b	4	Y	0.165
c	15	N	9.31	a	10	N	1.36	b	3	Y	0.164
c	14	N	9.27	b	12	Y	1.36	b	6	Y	0.158
Average				**Average**				**Average**			
Producer	**Group**	**By-Prd**	**DM Deliveries**	**Producer**	**Group**	**By-Prd**	**ADG**	**Producer**	**Group**	**By-Prd**	**g/f**
a	9	N	9.12	d	20	Y	1.35	e	18	Y	0.157
b	7	Y	9.07	b	6	Y	1.34	e	17	Y	0.155
d	20	Y	8.87	c	15	N	1.33	d	20	Y	0.152
e	17	Y	8.85	b	7	Y	1.32	b	13	Y	0.148
f	19	N	8.64	b	3	Y	1.32	a	8	N	0.146
b	6	Y	8.48	b	4	Y	1.32	b	7	Y	0.146
Bottom 1/3				**Bottom 1/3**				**Bottom 1/3**			
Producer	**Group**	**By-Prd**	**DM Deliveries**	**Producer**	**Group**	**By-Prd**	**ADG**	**Producer**	**Group**	**By-Prd**	**g/f**
e	18	Y	8.28	a	9	N	1.31	a	10	N	0.143
b	12	Y	8.25	a	11	N	1.31	a	9	N	0.144
b	1	Y	8.05	e	18	Y	1.30	c	15	N	0.143
b	3	Y	8.02	b	5	Y	1.28	f	19	N	0.141
b	4	Y	7.98	c	14	N	1.25	c	14	N	0.135
b	5	Y	7.72	f	19	N	1.22	a	11	N	0.134

[a] By-product used, Y = yes; N = No

Table 2. Coefficient of variation for cumulative feeding period

Coefficient of Variation			
Lowest 1/3			
Producer	**Group**	**By-Prd[a]**	**CV**
b	7	Y	18.12
e	17	Y	18.99
a	11	N	20.59
a	9	N	21.03
c	14	N	21.11
b	6	Y	22.33
Average			
Producer	**Group**	**By-Prd**	**CV**
a	8	N	22.42
c	15	N	22.73
e	18	Y	23.35
b	12	Y	25.12
a	10	N	25.24
b	4	Y	25.66
Highest 1/3			
Producer	**Group**	**By-Prd**	**CV**
b	3	Y	25.66
b	5	Y	25.66
b	1	Y	26.36
f	19	N	27.28
d	20	Y	28.93
b	13	Y	54.02

[a] By-product used, Y = yes; N = No

Table 3. Coefficient of variation for initial 28 days on feed.

Coefficient of Variation 0-28 DOF			
Lowest 1/3			
Producer	**Group**	**By-Prd[a]**	**CV**
c	15	N	5.54
e	18	Y	9.26
e	17	Y	9.42
b	5	Y	9.82
d	20	Y	10.15
b	4	Y	12.94
Average			
Producer	**Group**	**By-Prd**	**CV**
b	3	Y	12.94
b	6	Y	13.76
b	12	Y	13.77
b	13	Y	15.57
a	8	N	15.57
b	7	Y	17.34
Highest 1/3			
Producer	**Group**	**By-Prd**	**CV**
b	1	Y	18.11
c	14	N	18.66
f	19	N	19.09
a	11	N	20.59
a	10	N	21.08
a	9	N	21.85

[a] By-product used, Y = yes; N = No

Figure 1. Top 1/3 Feed Efficiency Dry Matter Deliveries